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As we go to press the daily newspapers report that the eastbound Twentieth Century Limited, making its fourth trip on the 18-hour schedule, met with a terrible disaster at Mentor, Ohio, on the Lake Shore & Michigan Southern, Wednesday night at 9:25. Running at high speed, the train dashed through an open switch, close to the station, and the engine and first one or two cars were completely wrecked. Eleven or more persons were killed, including the engineman and two or more other trainmen, and 15 or more were injured, though all the occupants of the cars behind the first one appear to have escaped with slight injuries. The foremost car was piled upon the engine and took fire, and the bodies of five of the victims were burned beyond recognition. The only explanation of the cause thus far given is that the men of a freight train probably had left the switch misplaced. Occurring at this time, when the newspapers are full of the exploits of fast trains, this disaster will attract universal attention; and if it leads to an adequate realization of the danger connected with unprotected facing-point switches, it may not have occurred in vain. On roads running trains at the highest speeds the existence of switches of this kind not provided with a distant signal is, of course, utterly indefensible.

The Union Switch & Signal Company's No. 2 Electric Train Staff is now in use on the Philadelphia & Reading, between Hillside, Pa., and Willow Grove, about two miles, and as high as 102 special passenger trains have been run over the section in 10 hours. Willow Grove is a summer resort, patronized largely by one-day visitors from Philadelphia, making the traffic on favorable excursion days far heavier than the normal amount. The number two staff apparatus is that which was described in the *Railroad Gazette* of December 23 last. This would seem to be a situation in which the staff system should be peculiarly serviceable, for it would be easy, if necessary or desirable, to take it out after the cessation of the rush of traffic. With proper arrangements and instructions there ought to be no difficulty in shortening block sections for use with heavy traffic and lengthening them for light traffic. With line wires already strung, and with suitable office fittings and semaphore connections established, a pair of staff instruments can be quickly set up. To use a certain pattern of staff between A and B to-day and the same between A and C to-morrow would be objected to by some as an innovation, and perhaps as a risky one; but we are inclined to think that the risk could be readily overcome. By having changeable thimbles or coverings for the staff, or by changing the style or location of the receptacle in the locomotive cab, the difference in the termini of the section could be made too noticeable to be forgotten. The train staff is suited for a much larger field than it occupies, and appreciation of the merits of the principle seems to be growing; but why does it not grow faster? The use of the staff temporarily at a tunnel on the Chicago Great Western (described in the *Railroad Gazette* of January 27, page 72) was an instructive incident. Wideawake signal engineers now understand the desirability—and necessity—of providing complete signaling for temporary single track sections, even if the need is to continue only through a single day, or even less time; and to have on hand a pair of staff instruments ready for prompt dispatch to any such section at which they may be needed, would seem to be the best possible way of equipping the signal engineer to do his part in emergencies of that kind. The staff not only affords the highest degree of safety but also possesses as high a degree of celerity as any other device or method used for the same purpose.

CAR DAMAGE BY ACT OF PROVIDENCE.

The report of the Arbitration Committee of the Master Car Builders' Association presented to the Convention this year is unique in that it records the first case since the adoption of the Rules of Interchange where a railroad has refused to abide by the decision of the Arbitration Committee and has returned unpaid to another railroad a bill for a car destroyed on its lines in the face of previous decisions of the committee that the bill was correct and should be paid. The case arose after the refusal of the Missouri Pacific to pay for a car belonging to the Pennsylvania Railroad which was one of many destroyed in Kansas City at the time of the disastrous flood in June, 1903. The Missouri Pacific claimed the flood was an act of Providence for which it could in no way be held responsible, and acting on the ruling of the General Managers' Association that the railroads suffering loss as a result of that flood should not pay for cars belonging to foreign roads, it has refused to settle. A number of other cases of dispute arising from the same circumstances are still unsettled, this being the only one in which an appeal has been taken to the Master Car Builders' Association.

The precedent established by the action of the Missouri Pacific endangers the long standing authority and power of the Arbitration Committee and the very existence of the Master Car Builders' Association itself. The code of rules governing the interchange of cars is a formal contract, binding on all the parties signing the agreement and accepted unconditionally and as a whole. In the preface, the rules state that "railroad companies handling cars are responsible for damage done to any car by unfair usage, derailment or accident," and Rule 131 says "the decisions of the Arbitration Committee shall be final and binding upon the parties concerned." No possible interpretation of these two clauses in the rules can relieve the Missouri Pacific from responsibility for the loss of the car belonging to the Pennsylvania Railroad, and there is a plain breach of contract involved upon which an action could be sustained in any court. Arbitration case No. 654 plainly stated the responsibility of the road handling a car destroyed by an act of Providence, and the responsibility exists with equal force in this case. It is a plain violation of the letter and the spirit of the agreement, and is the first time that the association has been called upon to determine what action it should take. Viewing the matter from a legal standpoint, the association needed to take no action whatsoever, since the breach of contract plainly existed and the party to the agreement, guilty of the breach, is no longer a party to any of the other provisions of the agreement or entitled to the benefits derived from it. In other words, so far as the Missouri Pacific is concerned under the interchange rules any road destroying cars belonging to it could not be held responsible for them no matter what the cause of the damage, although it might recover under the common law. The Arbitration Committee in presenting its report to the association recommended that the rules stand as they now are, and this recommendation was unanimously adopted. No action was taken in the case of the Missouri Pacific, depriving its representatives of privileges of membership in the association, nor does there seem to be any reason why such action should have been taken. The standing of that road's representatives in the association has been in no way affected, but its standing as a party to the agreement covering the interchange of cars is certainly destroyed by its refusal to abide by the express terms of the contract which it signed.

The Master Car Builders' Association has for a long time had the unique distinction of being the only association of railroad officers which had wide powers to enforce its adopted

standards. This has been the keynote of its success, and to this authority can be ascribed the most important improvements in railroad operation which have taken place since the first inception of railroads. The association has been directly responsible for the enforced use of safety appliances approved by it, and to its influence the railroads owe the general adoption of the automatic coupler and the air brake. No other association, with the possible exception of the American Railway Association, has the high standing which it enjoys. While its members are subordinate officers, at the same time they act as representatives of the higher officers and their acts are accepted with the same confidence as though their superior officers themselves had formulated their course. The action of the Missouri Pacific seems to be based on an order issued by the General Managers' Association of Chicago. This association is local in its action and authority and cannot compare in importance with the Master Car Builders' Association, and yet it sets itself up as dictating to the Master Car Builders' Association as to whether or not a formal contract shall be observed. While perhaps the General Managers' Association of Chicago in issuing such an order as it did at the time of the flood at Kansas City did not intend to set up its authority against the authority of the Master Car Builders' Association, at the same time, by its continued refusal to withdraw its order it threatens the standing and existence of the older and more important organization. We do not believe that any local organization, such as this is, would dare to attempt to deliberately undermine the authority of the Master Car Builders' Association with respect to controlling the interchange of cars. The general managers are no less interested in the interchange of cars than the master car builders, who are their subordinates.

In the event of the Missouri Pacific insisting on establishing such a dangerous precedent the result of its taking such a stand would be widespread and disastrous to the primary principles of railroad operation. The free and unrestricted interchange of cars has come to be absolutely essential to railroad operation, but this interchange would no longer be carried out if the fundamental principles of the rules of interchange were by this precedent declared void. Any number of cases might be cited in which a railroad would refuse to let its cars run over the lines of some other railroad. To take a case analogous to the one in question. If the receiving road declared that it would not be responsible for damage caused by an act of Providence it would be only natural that during the spring months when floods in the West are frequent and oft recurring, the eastern roads would refuse to allow their cars to be sent west of Chicago. They would be fully justified in such a refusal. Trans-continental shipments would be delayed and enormous sums would be spent in transferring loads from one car to another at the points beyond which the eastern roads refused to allow their cars to run. The railroads could much better afford to pay the damages resulting from the destruction of foreign cars than to bring upon themselves such a condition as this.

The wisdom of the association in approving the recommendation of the Arbitration Committee that the rules remain as they now are needs little comment. The insertion of a clause into the rules providing for responsibility in case of damage or destruction of cars caused by an act of Providence would involve an endless amount of dispute and litigation as to just what an act of Providence was. As one member of the association stated at the meeting, the only way in which cases arising could ever be satisfactorily settled would be to have Providence made a member of the Arbitration Committee. By taking such action as it has, the Master Car Builders' Association has once more put itself upon record as standing for the best and most conservative railroad practice, and it is to be congratulated on its wise action.

THE WISCONSIN RATE COMMISSION

The contest in Wisconsin over the creation of a railroad commission with authority over rates has ended. This fight has been on for two years and more. The fall campaign of 1904 resulted in the election of Governor La Follette to a third term as the champion of the issue on the establishment of a rate-making commission. Throughout this campaign and in all of his messages since January, 1903, the railroads have been held up by Governor La Follette as the chief enemies of the state and nation. The measure introduced at the beginning of the session of the present legislature was set forth and criticised in the *Railroad Gazette* of March 24, and the opinion was then expressed that no such radical measure as was proposed would be passed. That prediction has been verified by the outcome. Governor La Follette has not secured anything like so radical a measure as he attempted to inaugurate. Mr. E. P. Bacon, of Milwaukee, chairman of the Executive Committee of the Interstate Commerce Law Convention, held at St. Louis in October, 1904, who represented—or constituted—most of the aggrieved shipper interest before the Interstate Commerce Committee of the United States Senate, was brought before the legislative committee which had the commission bill in charge. Nothwithstanding the fact that he strenuously advocated the idea that a state could advantageously afford to go further than the United States Government could, and actually promulgate freight rates, the legislature refused to follow his lead, and Wisconsin's new law gives the commission rate-reviewing, but not primary rate-making powers. The railroads will still make their own rates, and these cannot be attacked by the commission except by giving ten days' notice to the railroads concerned, and they cannot be altered by the commission, except after due hearing and investigation.

From the railroad standpoint the worst feature of the law is that any changes the commission may see proper to order will be in effect pending appeal. That the measure is not entirely satisfactory to Governor La Follette's views is evident from the memorandum he attached upon signing the bill on June 13th which is as follows:

In approving this bill I deem it fitting to attach the following memorandum: I regret that the bill does not contain a provision authorizing the commission to deny railroads and other public-service corporations the right to issue stocks and bonds, without first showing to the satisfaction of the commission that the property of the corporation owned at the time of such issue, and that proposed to be acquired with the proceeds of the sale of such stocks or bonds, is equal in value to the stocks and bonds then outstanding, added to the stocks and bonds which it is proposed to issue.

There are other omissions and there are terms of limitation in some of the provisions of the bill which may, in some respects, impair its efficiency. I approve the measure, however, as the best which it is possible to secure at present, and as, in many respects, the most progressive, and, at the same time, the most conservative law yet enacted, regulating rates and railroad services.

The clause of this memorandum which refers to limiting securities to fair replacement value, as it is termed in Massachusetts, would have been a sound and useful addition to the statute; most of the "other omissions" from the Governor's original draft are more honored in the breach than in the observance.

Instead of a single railroad commissioner elected biennially with $3,000 salary and with very limited power, Wisconsin is to have a railroad commission of three members with salaries of $5,000 each, appointed for six-year terms, with extraordinary powers. The new commission is "strong," according to the Interstate Commerce Commission's classification on the basis of powers with regard to rates, while the old commission was weak.

The passage of the measure in its present form illustrates quite remarkably the vicissitudes of political life, for it actually legislates the present state railroad commissioner out of office, although he was elected to his office last fall by a larger majority than any other state officer. The measure provides that the powers vested by law in the present commissioner shall be transferred to the commission, except that the commissioner is to remain in office till January, 1907, at his present salary, to complete an investigation he is conducting into certain alleged evil practices of the railroads in reporting their earnings.

Since Wisconsin, under the leadership of Governor La Follette, is bound to abandon the policy towards its railroads under which the state has made such rapid and wonderful progress in the past, the measure must be accepted as being about as good a one as could be devised of the kind. It does not wholly deprive the railroads of the state of that elasticity in rate-making which means so much in rapidly developing districts. The railroads may introduce experimental rates—may alter existing rates—as often as they like, provided the proposed changes are published ten days beforehand and provided that the commission is notified and does not take steps to show the proposed changes "unreasonable." The measure is the chief result of five months of hard work and study on the part of the legislature. There were conservative men, friendly to the transportation interests of the state, in the upper house, and the fact that practically the same bill which has now become a law passed this house without a dissenting vote may be taken as an assurance that these senators had become convinced that the railroads would suffer no great harm under the proposed law.

As is usual with laws creating state commissions, the qualifications named for service on the commission furnish a primary objection. The qualification clauses of the law read:

One commissioner shall have a general knowledge of railroad law; each of the others shall have a general understanding of matters relating to railroad transportation.

No person so appointed shall be pecuni-

arily interested in any railroad in this state or elsewhere. . . .

No commissioner, nor the secretary, shall hold any other office or position of profit, or pursue any other business or vocation, or serve on or under any committee of any political party, but shall devote his entire time to the duties of his office. . . .

As a check upon the appointment of radical or irresponsible men the law provides that the selection of commissioners must be approved by the Senate. In one quite unusual respect the law is a great advance over most state railroad commission laws. It is not necessary that a commissioner be a resident of the state. Thus, if a man having a specially expert knowledge of railroad traffic should be wanted on the commission at any time and could not be secured within the state on account of connection past or present with existing roads, his availability will not be cut off on account of non-residence.

That the Senate intended the check that it has put upon the appointing power by the Governor to be used as occasion requires, has been demonstrated in the confirmation of the appointment of the first commission under the new law. On June 16 Governor La Follette sent to the Senate his nomination for members of the Commission. They were Professor B. H. Meyer, Halford Erickson and Nils P. Haugen. The two names first mentioned were approved without a dissenting vote. But confirmation of the last was refused by a vote of 16 to 11. Professor B. H. Meyer has for many years been connected with the University of Wisconsin. He was chosen by the Interstate Commerce Commission a year ago to make a valuation of all the railroads in the United States for the Census Bureau to be published in the volume, "Wealth, Debt and Taxation." He has also been chosen by the Carnegie Institute to write the history of the railroads for the History of Economics in the United States. He possesses no spirit of antagonism against the railroads, and his object in accepting a place on the commission is to work out railroad problems at first hand in his own state.

Mr. Ericsson has been commissioner of labor and industrial statistics in Wisconsin for some ten years, and before that he was an employee for seven years of one of the larger railroads in the state; for a part of the time at least, in the auditing department. Thus he has special training as a railroad man and as a statistician. Mr. Haugen is a professional La Follette politician who has obeyed orders to the letter. He was railroad commissioner in 1883, is an ex-congressman, and was at one time a candidate for the governorship of the state. He is said to have a good grasp of the railroad situation in the state, and to be a thorough student and a hard worker. He is a member of the state tax commission, and his work in the late valuations of the railroads as well as his past experience as railroad commissioner should have made him a very useful member of the new commission. He was nominated for the longest term on the commission, a first term of eight years. But the conservatives were afraid of him, and even the chairman of the Senate Committee on Railroads, who had been the Governor's mainstay in piloting the commission bill through the legislature, voted against his confirmation.

Whatever is the outcome of the work of this commission the final results are likely to be rather of scientific interest than of great direct import to the average citizen of the state. Notwithstanding the long and heated struggle and the frenzy with which the issue has been presented, the proportion of intrastate freight in Wisconsin is small, and the changes that a "strong" but conservative commission may be expected to effect in the rates governing this traffic will probably not be of much interest to the average shipper or citizen. Wisconsin is a producing and manufacturing state, and the interests of its citizens lie in interstate commerce. It has been conclusively shown that between 75 and 80 per cent. of the freight moving in the state will be entirely outside of the local regulating powers. Now that the state has its commission and the long struggle is over, intelligent citizens are asking themselves if the game has been worth the candle.

MUNICIPAL OWNERSHIP OF STREET RAILWAYS.

Municipal control of almost every form of public service has been advocated in this country for a great many years, and has been quite frequently tried in the operation of water and lighting plants, and much less frequently tried in its application to street railway systems. The main argument of the municipal ownership advocates is that public service utilities should be supplied at a charge which approximates their cost, and not operated for profit. The main argument of those who are opposed to municipal ownership, at least in this country, is that municipal corporations, to state it frankly, are inefficient and dishonest; that they are strongly subject to political influence, and that as a result of these evils service is less good and cost is higher than is the case under private management. The city of Chicago just now is the center of municipal ownership agitation. Some time ago it was Cleveland, with Mayor Johnson and his three-cent fares. The great defect of the movement in both of these representative cities has been that it was not based on the honest belief of any preponderating number of good citizens, but was largely a political talking point. Big corporations are not apt to be popular with the people who do business with them directly, and the public service corporations (including street railways, which are sometimes excluded from this heading), get themselves so intimately known that almost every citizen is confident that he himself could furnish a better and cheaper service if he only had the plant and the opportunity; hence it is that the advocate of municipal ownership can always find an audience.

But Chicago carried her theories beyond their merely political aspect. She went so far as to get a first-class municipal street railway expert to come to this country and look over her field—Mr. James Dalrymple, who is manager of the Glasgow Corporation Tramways. Glasgow formerly had a horse-car system, which was owned by private capital, but it was somewhat restricted in its franchises, and when the lines were electrified and operated by the municipality it was an easy task to improve and greatly popularize the service, which is pointed out as a prominent example of a successful case of municipal ownership. Mr. Dalrymple was brought to Chicago to convince the doubters that municipal ownership of the Chicago street railways could similarly save money and improve service.

But the political effect of his report was irretrievably ruined because it happened to be a document on the wrong side of the case. His two addresses on the subject, one upon his arrival and the other upon his departure from Chicago, have been much quoted. Soon after he landed he said that he saw no reason why Chicago, or any other city in this country, should not be able to own its street railways and to run them with as much success as had been achieved at Glasgow. He understood that the Chicago problem was a much larger one, but believed that the underlying principles were the same. His point of view was that the municipal corporation would be content to run on a much closer figure of profit than a private corporation would; hence that fares could be lower. But by the time Mr. Dalrymple left Chicago he had gotten pretty thoroughly out of the spirit of a Scotch municipality and into the spirit of an American one, and he said, concisely, that to put street railways, gas works, telephone companies, etc., under municipal ownership in this country would be to create a political machine in every large city that would be simply impregnable. He added that these political machines are already quite strong enough, with their control of policemen, firemen and other officeholders. Said the Scotch manager, "I came to this country a believer in public ownership. What I have seen here—and I studied the situation carefully—makes me realize that private ownership, under proper conditions, is far better for the citizens of American cities."

It is not to be supposed that the advocates of municipal ownership will accept Mr. Dalrymple's conclusions on this point, but it may be presumed that they will in the future hesitate to use Glasgow as their chief argument, for Glasgow has turned against them. If we are to have campaigns based on British experience, however, it may be as well to understand the British conditions a little more clearly than they are commonly understood at present. Public opinion to the contrary, it may be absolutely laid down as a starting fact that British tramway service is slow and expensive, while American tramway service is fast and cheap. The municipal agitators speak of the penny (two cent) fares which prevail in every English town, but the man who rides on a street car in this country is not concerned about the hypothetical fare in a zone perhaps a mile in diameter. He uses the street railways as a kind of first cousin to the steam railroad commutation service, and in the large cities especially he expects a ride of at least three or four miles and perhaps considerably more than that, for a five-cent fare. The United States Consul at Birmingham, England, recently made the very sensible comment on this subject that the street car travelers who can afford to take short rides are the ones who can afford to pay full fares. The cheap short-distance system of fares also practically excludes the adoption of the transfer system. The Consul pointed out that in Birmingham, England, if a person happens to live just outside one "penny stage," and in going to and from his work must traverse this stage and go beyond it, he must pay six cents for a ride of a trifle over two miles. With regard to running speed, the Board of Trade limitations and traditional practice keep this

at an average which is certainly not half as fast as that prevalent in this country. An electric car on an open stretch of highway in England is not permitted to exceed a maximum of 12 to 14 miles an hour between stops, as compared with the road speeds of upwards of 40 miles an hour made by our interurban cars. Take this low speed limit for one cause and a series of mutually jealous municipalities for another, and it is possible to understand the limited usefulness of tramway services in England. The characteristic of our interurban lines is that they were formed by coupling up the local lines of cities and towns into through routes across the country. The British tram lines form no such through routes, but radiate feebly from each town like the points of a star. Mr. Dalrymple's 70-mile system is the second longest street railway system in Great Britain, being exceeded only by the Manchester Corporation, which has 85 miles of route and 150 miles of track. In the length and breadth of the British Isles there are just 12 tramway corporations that operate 30 miles of route or more. In the Manchester district the longest through tram run is from Eccles to Whitefield, 11 miles, and there is scarcely a 15-mile straightaway suburban tram line in Great Britain. The busiest service in the Manchester territory is furnished by the Stockport line, 5 miles long, on which the running time from Manchester to Stockport is 35 minutes and the fare 8 cents. Before American citizens become too deeply committed to municipal ownership of street railway lines on a strictly British basis they would do well to be quite sure that they are willing to spend eight cents for a five-mile ride at a road speed of 8¾ miles an hour.

But besides these physical differences between British and American tramway services, there is the difference, perhaps best described as temperamental, in the respective attitude of the people by the two countries to their local governments. An Englishman takes his municipal officers quite seriously, and holds them responsible for good government to an extent that simply cannot be appreciated here. American municipal good government comes in waves—sharp peaks, with deep, broad valleys between them—that render impossible any continuous policy of integrity and efficiency. As a people we are prone to cure all evils, real and imaginary, by passing laws and creating offices, leaving the laws unenforced and the offices unwatched, subject to every form of political corruption. The sum of the matter is that in the present generation, at least, municipal ownership in America has little to offer, either in honesty or in efficiency, in the management of such public utilities as tramways, which are on the border line between service that is the natural field of private enterprise and service that must inevitably be performed by the city.

The campaign of the New Haven road for the repeal of the Connecticut free freight-car law, has met an opponent in the New England Grain Dealers' Association, which has sent a memorial to the Connecticut legislature asking that the law requiring 96 hours' free time for unloading bulk freight be continued. The arguments presented by the grain dealers are neither forcible nor new, but they have the merit of being cogently set forth. They are numbered from one to seven, and in condensed form, may be stated as follows: 1. In New England the towns were built before the railroads and industries, therefore do not have private sidings; this necessitates teaming more than in the West. 2. The other New England railroads grant the free time without compulsion. 3. Carloads are now much larger than formerly and therefore it takes longer to unload a car. 4. Grain dealers have four or five cars arrive together, even when shipped weeks apart, and can get no allowance for this except by making a special claim for refund of demurrage. 5. The New Haven road frequently delays cars in transit. 6. Other states are making or considering laws to require the railroads to pay a penalty when cars are delayed in transit. 7. There is no new reason for the New Haven's complaint. The burden imposed by its payment to the other companies of per diem is not a new thing, and the deficit in its income should not be charged to the 96-hour law. . . . The only real grievance that we can find in this list is item No. 4; if a railroad charges a consignee too much demurrage, it should refund the excess promptly and without friction. Item No. 2 is probably put in as "filler," for the grain men must know that it is the competition of the New Haven road that compels the other roads to give four days for unloading. The trouble with the fifth and sixth arguments is that, although a railroad should pay a penalty for unreasonable delays in transit, there is no practicable way to adjust this penalty except in making the rate for transportation. If the railroads were to carry all freight with the promptness and regularity that characterizes the passenger service, the cost would be increased, and the rates would necessarily have to be advanced in the same ratio; from which it is fair to reason that the present rates are adjusted to the present average degree of despatch. To adjust the penalty in each case would simply mean interminable litigation. Argument No. 1 is as much of a "curiosity" as would be a grain elevator in Minnesota without a side track; and the seventh is based on a false statement. Keeping cars standing on side tracks in freight yards a single hour longer than is necessary for their loading or unloading is a waste, and every effort made by a grain merchant, or anybody else, to prolong this waste is an effort toward increasing the cost of transportation.

The eighteen-hour trains between New York and Chicago are, of course, making fine records. The Pennsylvania's began running June 11 and the New York Central's June 18, and thus far nearly every train has reached destination on time or a few minutes ahead. On the New York Central the first trains run at the increased speed were reported as much as 20 minutes ahead of time at some division terminals, which would seem to indicate that the officers of the transportation department meant to take the fewest possible chances of having fine records spoiled by accidental delays. That the speeds prescribed for these trains were easily within the power of the best locomotives now in the service of these roads was a foregone conclusion. The trains have only four cars, including the diner, and that is taken off after dinner is finished, leaving only three. For the steep grade from Altoona to Gallitzin the Pennsylvania uses two engines for these three cars. That the patronage of the trains would be satisfactory was also known beforehand, from the good business done by the Twentieth Century Limited of the New York Central during the past two years. One of the eastbound trains is said to have refused 33 passengers. On both roads, however, the first runs appear to have been favored by the company of a number of dead-heads—railroad officers and reporters. Whether an 18-hour train affords enough additional convenience over a 20-hour, to justify the added risk of coming in behind time, the increased derangement of slow-train traffic and the slightly decreased comfort of riding, is a question which is, perhaps, not to be easily settled, as passengers who ride on these trains do not spend much time weighing the extra two dollars that they pay for the increased speed, and may not be able readily to discriminate in estimating the comparative physical results of the two speeds. As to the best speeds made for short distances, we have not yet received official records; but 90 miles an hour appears to have been made at innumerable places. A dozen or more delays have been reported already, but most of them have been overcome, as above stated. Hot boxes, automatic signals out of order difficulty with couplings, one locomotive failure (necessitating the use of a freight engine for 12 miles) and other causes have delayed the trains for from 5 to 40 minutes; but the reserve power of the Atlantic and Pacific type locomotives now in service was more than equal to the tasks thereby imposed on them. The eastbound train of the New York Central that arrived in New York on the 20th is said to have spent less than 16 hours in actual running, a number of delays having occurred. On the Pennsylvania one engine takes the train through between Jersey City and Harrisburg, 188 miles. The distances by the two roads, as given by a careful reporter, are:

Pennsylvania.

Jersey City to North Philadelphia	84.0 miles.
North Philadelphia to Harrisburg	104.3 "
Harrisburg to Altoona	131.4 "
Altoona to Pittsburg	116.7 "
Pittsburg to Chicago	468.0 "
Total	904.4 miles.

New York Central.

Chicago to Elkhart	101.10 miles.
Elkhart to Toledo	133.40 "
Toledo to Cleveland	107.80 "
Cleveland to East Buffalo	182.07 "
East Buffalo to Syracuse	145.48 "
Syracuse to Albany	147.73 "
Albany to New York	142.94 "
Total	960.52 miles.

TRADE CATALOGUES.

Back-Geared Motors.—The Northern Electrical Mfg. Co., Madison, Wis., sends its bulletin No. 44 which illustrates representative applications of back-geared motors in industrial plant service.

Electric Lighting.—"Lighting" is the title of the Crocker-Wheeler Company's, Ampere, N. J., Flyer No. 267. In it illustrations and brief descriptions of both alternating and direct-current generators are given.

Steam Engines and Water Tube Boilers.—The Atlas Engine Works, Indianapolis, Ind., are distributing two pamphlets. One illustrates and describes in detail the Atlas medium speed engines, and the other contains a full detailed description and illustrations of the Atlas water tube boilers.

Boilers.—The Parker Boiler Co., Philadelphia, Pa., sends an interesting catalogue which illustrates and describes in detail the Parker boilers. A number of testimonial letters are given as well as the results of a comparative test of the Parker boiler and a boiler of the inclined tube type.

Condensers.—The W. H. Blake Steam Pump Co., Hyde Park, Mass., is distributing a folder descriptive of its horizontal air pump and jet condenser and of its surface condenser with air circulating pump. The

advantages to be derived from separate condenser units and illustrations of the same are also given.

Rotary Planing Machines.—The Newton Machine Tool Works, Philadelphia, Pa., sends its catalogue No. 41, which illustrates and describes its latest designs of horizontal and vertical rotary planing machines. Illustrations of rail bending machines, cold saw cutting-off machines and milling machines are also shown.

The Union Pacific passenger department is distributing half-tone engravings of a photograph of "General U. S. Grant and Party" at Fort Sanders, Wyo., 2½ miles south of Laramie Station, on the Union Pacific, in 1867. Besides General Grant the group includes many other notables, among them Generals Sherman, Sheridan and Dent, General Dodge, Chief Engineer of the Union Pacific; Sidney Dillon, and Thos. C. Durant, President of the construction company building the Union Pacific. The engraving is 8¾ x 11½ in., and many of the likenesses are quite distinct.

Ore and Coal Handling Machinery.—The Wellman-Seaver-Morgan Company, Cleveland, Ohio, sends a handsome catalogue containing about 100 9-in. x 12-in. pages. Illustrations of both the interior and exterior of the company's Cleveland and Akron plants are given. Detailed descriptions and illustrations of the various appliances made by the company, including the Hulett patent automatic ore unloaders; unloading and reloading bridges, cranes, etc.; car dumping machinery; locomotive cranes and revolving derricks, and excavating buckets, etc., are also shown.

Compressed Air and Its Uses.—The July issue of *Air Power*, the technical quarterly devoted to compressed air and its uses, published by the Rand Drill Co., New York, will contain among other things a complete description, illustrated by diagrams, of a displacement pump, written by Prof. E. G. Harris; a description of a recent installation of a compressed air mine haulage system by A. A. Bowman; The Uses of Compressed Air in the Wood-Working Shop, by W. R. Hulbert; a description of the construction of the new Duluth ærial bridge; an article on the Philadelphia high-pressure pumping plant; a practical article on air compressor foundations by E. M. Mackie, and three new inventions as follows: A new tunnelling machine, a pneumatic stake driver used by Barnum & Bailey, and a device for conveying hot rivets through a metal tube by compressed air. The rest of the paper is made up of short paragraphs containing odds and ends of useful information.

Water Spaces Around Fireboxes.*

In endeavoring to discover what is known on this subject I made an examination of the water space dimensions of some 84 modern boilers. This investigation showed that there is no generally recognizable rule connecting the size of the water space with the firebox dimensions, but that there is an increasing tendency to use wider water spaces. So many reasons for the use of wide water spaces can be brought forward that it appears strange that the width has not been increased more rapidly. When the fireboxes were restricted in width by being placed between the wheels, the necessity of obtaining all possible great area made it desirable to keep down the width of the water spaces to a minimum. Now, however, with the wide fireboxes above the wheels, there is but little excuse for reproducing these cramped water spaces. A free increase in the width of the water space around the firebox increases somewhat the dead weight of the engine, but the advantages to be gained will undoubtedly more than offset this.

I do not know of any experiments which will show the influence of the width of the water space on the evaporation, but it is obvious that a free circulation of the water will be ensured by wide water legs and will help the evaporative power of the firebox heating surface. In addition to the size of the water spaces, their shape has considerable influence on the evaporation and life of the firebox.

As the water in contact with the side sheets is turned into steam it must be allowed to rise to the steam space and must be replaced by other waters. The water spaces should be so designed that this natural circulation is aided, and that the currents of steam and water impede each other as little as possible. This is secured if the firebox side sheets are vertical or with a slight slope outward as they rise from the mud ring, so that the steam can rise along the firebox sheets and the water descend along the outside steel sheets without mutual interference.

If, on the other hand, the firebox sheets slope inward in rising from the mud ring, the steam will tend to rise from the side sheets through the water space and along the outer sheets to the surface, thus interfering with the descending water current.

The side sheets, being subject to the full effect of the fire, require an active supply of water to allow the vigorous evaporation to proceed properly. If the water spaces are cramped or badly arranged, so that the water supply is not kept up, the water will fail to reach large areas of the side sheets, with results very detrimental to the life of the firebox sheets and staybolts.

In one case of this sort we found on a certain lot of locomotives that there was a well-defined oval space on each side sheet in which it was impossible to keep the staybolts tight until the cause of the trouble was removed by redesigning the water space to give the water free access to the side sheets.

Another advantage obtained by the widening of the water spaces is the increased flexibility and endurance of the staybolts. Some tests recently made on the Baldwin Locomotive Works vibratory staybolt testing machine show the advantage which can be expected from this source. Nine test pieces were cut from the same bar and vibrated with a deflection of $^{3}/_{32}$ in. each side of the center while under a load of 4,000 lbs. All conditions were the same except the length of the test piece vibrated. Three bars were 8 in., three 6½ in., and the remaining three were 5 in. in length. The average number of vibrations before fracture was 1,620 for the 8-in., 960 for the 6½-in. and 695 for the 5-in. bolts. An increase of 60 per cent. in the length of the bolt added more than 130 per cent. to its life when vibrated.

It appears that the rule for the best width of firebox water space is very much like Mr. Forney's rule for the size of a locomotive boiler, which is make it as large as the other conditions permit. The figures obtained show a wide variation in practice. Among the wide firebox engines the narrowest water space measured as follows: Front leg, 4 in. at mud ring and 5 in. at throat; side and back legs, 3 in. at ring and 4 in. at crown. The widest space had a front leg measuring 5 in. top and bottom; side legs, 5 in. at ring and 6 in. at crown; back leg, 5 in. at ring and 7½ in. at crown.

*A topical discussion by Lawford H. Fry, at the Master Mechanics' Convention June 14.

The Use of Superheated Steam on Locomotives.*

The earliest recorded attempt at superheating was that reported in 1828 by Richard Trevithick, at the Birnie Downs Mine in Cornwall, on a condensing pumping engine making eight strokes per minute, with a boiler pressure of 45 lbs., in which the cylinders and steam pipes were surrounded with brickwork and heated from a fire burning on a grate underneath. The results were remarkable, for, while performing the same amount of work, 9,000 lbs. of coal were used per 24 hours without the fire under the cylinder, against 6,000 lbs. when it was in use, the coal for superheating included. This experience led Trevithick to the invention of his tubular boiler and superheater, which was patented in 1832, and was a remarkably modern-looking arrangement, the boiler proper consisting of vertical water tubes surrounding a circular grate and forming a vertical flue in which other tubes were placed, through which the steam, generated in the boiler, passed on its way to the engine. Owing, no doubt, to the difficulty in regulating the temperature of the steam obtained from such an apparatus, little seems to have been done in the matter during the next 10 or 15 years, although in 1832, I. Howard, of Bermondsey, produced a superheater which obtained an economy of 30 per cent., and about 1835, Dr. Haycroft, of Greenwich, advocated superheated steam and found, experimentally, about the same saving.

From 1850 to 1865 the interest in this subject revived considerably, and a moderate degree of superheat was quite extensively employed toward the latter part of that period. Hirn, in 1857, published the results of experiments made by him at Colmar, which were the most carefully conducted tests that had, up to that time, been carried out, and showed that, on a simple engine, working with a boiler pressure of 55 lbs., economies of 20 to 47 per cent. could be obtained with superheat of 100 deg. to 190 deg. F. In 1859, John Penn read a paper before the Institution of Mechanical Engineers describing several applications to steamships, the superheater consisting of a number of tubes about 2 in. in diameter placed in the uptake just as it left the boiler, through which the steam passed on its way to the engine. The superheating surface was about 15 per cent. of the boiler heating surface, and with a boiler pressure of 20 lbs. on condensing engine, about 20 per cent. saving in fuel was obtained with a superheat of 100 deg. F. John Ryder, in 1860, in a paper before the same society described the Parson & Pilgrim superheater, which consisted of two horseshoe-shaped pipes placed in the internal flue of the boiler over the fire grate, and the Partridge, which was a cylinder filled with tubes through which the gases passed, the steam being around them. Both of these systems were stated to have given good results, which may appear rather questionable in the case of the former; but a total of 5,000 h.p. had then been equipped. The superheating surface employed was 2½ to 2¾ sq. ft. per nominal horse-power, or about the same as that described by Penn, and the economies obtained were practically equal.

Sundry other systems were in more or less extensive use about this time, such as the Crossland, Wethered, etc., and extensive experiments were carried out by Isherwood, in the American Navy, which confirmed the good results obtained abroad.

While a large amount of evidence was thus

*Extracts from a paper by Mr. H. H. Vaughan, S. M. P., Canadian Pacific, read before the American Railway Master Mechanics' Association, June 15, 1905.

created in favor of superheating, and it was employed to a considerable extent, placing it beyond the experimental stage, it gradually gave way before the development of increased boiler pressure and compounding, which commenced about 1865. When boiler pressures were from 20 to 40 lbs., superheaters in the uptakes, which gave 100 deg. to 125 deg. of superheat, could be employed without exceeding a temperature in the cylinder at which the animal lubricants used in those days would decompose and attack the valve faces and cylinder bores, but as the pressure was increased, the same amount of superheat could not be used. The absence of moisture in the superheated steam made lubrication necessary, and the packings used on valve stems and piston rods were also badly adapted for steam at high temperatures and gave considerable trouble when 350 deg. was exceeded. Trouble was also experienced in the superheater tubes, caused by deposits of salt on account of the use of the jet condenser, which was then universal. By employing a higher boiler pressure and avoiding cylinder loss by compounding, the same economy could be obtained as by superheating with a decrease in trouble, and its use gradually declined until about 1870 it was rarely employed on new work, excepting by the Alsatian group of engineers, by whom it was never abandoned. With the introduction of hydrocarbon lubricating oils, balanced valves and improved packing, the use of considerably higher temperatures became possible, and in 1890, interest in this subject was renewed by the attention drawn to the results being accomplished in Germany by such engineers as Gehre, Schwoerer, Uhler and others. Many results were published, all of which showed a gain from the practice, and in England, in addition to the introduction of their apparatus, several other types were developed along similar lines. Since that date the progress of superheating in stationary practice has been comparatively steady, although slow, and it has in general developed along the lines of moderate superheat, say from 50 deg. to 100 deg., no special type of engine or boiler being usually employed, and its subsequent history, with one notable exception, concerns stationary and marine practice rather than locomotives. That exception is the use of highly superheated steam, perfected after 14 years' experimenting by Mr. Wilhelm Schmidt, of Cassel, who succeeded about 1894 in producing a boiler and engine in which steam, superheated to 700 deg., was used at comparatively low pressures. The results obtained were reported by Messrs. Schneider and De Grahl in 1894, and were exceedingly economical, especially on small engines, and in 1898, 200 plants were reported to be working on the Schmidt system; but apart from these, highly superheated steam can hardly be said to have come into general use. In view of the present applications of superheated steam to locomotives, the general lines of its introduction into stationary and marine practice are interesting. Moderate superheating, employing temperatures up to 150 deg. above that of evaporation, first scientifically investigated by Hirn, introduced extensively into early English marine practice by Penn and others and then abandoned; continued in stationary practice in Alsace by Hirn's pupils and followers, has, in the last 10 or 15 years, become extensively used in stationary practice with increasing steam pressures. High superheating, developed by Schmidt, has been economical and satisfactory where employed, but so far, is not in general use.

Superheated steam is supposed to have been first applied to locomotives on the Chicago, Burlington & Quincy in 1870, the front tube sheet being set back some distance into the boiler, and the superheater, consisting of a separate cylinder in which the tubes formed practically a continuation of the boiler tubes and into which the steam entered by the dry pipe, and from it passed to the cylinders by pipes connected to the bottom. Such an apparatus could not have actually superheated the steam to any great extent, but it showed some economy which was not, however, considered sufficient to pay for its increase in cost and the trouble of maintaining it, and it was subsequently abandoned. The present development in the application of superheated steam to locomotives is due to Messrs. Garbe and Muller, of the Prussian State Railways, who, in 1898, arranged to equip two engines, Hanover No. 74, built by the Vulcan Company, of Stettin, and Cassel No. 131, built by Henschel & Co., the design being prepared by Mr. Schmidt. In a paper read by Mr. Garbe in 1902, before the Berlin branch of the Institution of German Engineers, he related the various reasons that led him to a consideration of the advantages of superheated steam, and discussed in a comprehensive way the benefits derived from its use and the resusts at that time obtained. This paper is of special interest, as it describes the first modern application of superheated steam to a locomotive, and shows it to have been a decided success. These engines were followed by others, for which Mr. Schmidt designed what

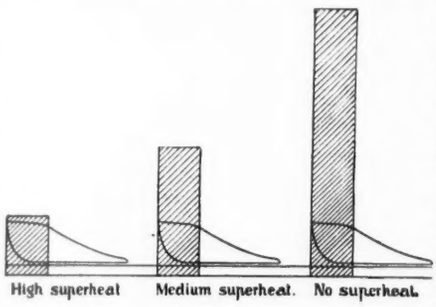


Fig. 1.

is now known as his smoke-box type of superheater, and in 1899 one engine was put into service with this device. It was followed in 1900 by three others, and in 1902 by 24, 13 of the latter being eight-coupled freight engines, until by the end of 1904 the Prussian State Railways had put into service 127 engines using superheated steam, all except the original two and the last one having the smoke-box type of superheater. Other European roads have, since 1902, also built engines with the Schmidt design of superheaters, the smoke-box and the smoke-tube types being used about equally, and in all about 170 of these engines are in service. Other engines have also been equipped with the Pielock, a rather different type of superheater from the Schmidt, which was developed in 1902, and which has now been applied to about 30 locomotives, 13 of these being on the Prussian State Railways, so that, in all, fully 200 engines in Germany are now running with superheated steam. In America it was introduced by Mr. Roger Atkinson, then mechanical superintendent of the Canadian Pacific, who, in 1901, applied a Schmidt smoke-box superheater to an 18 by 24-in., 10-wheel simple freight engine with 62-in. wheels. This engine proved exceedingly satisfactory, and was followed two years later by two 10-wheel compound freight engines, which were equipped with the Schmidt smoke-tube arrangement. All these engines showed a substantial economy over similar engines of the ordinary type, and, in 1904, 41 simple consolidation engines were built, of which 20 were equipped with the Schmidt and 21 with the Schenectady superheater. During that year one of the latter type was also applied to an Atlantic type simple engine on the New York Central and to a 10-wheel passenger engine on the Canadian Pacific. During the present year, 1905, the Canadian Pacific is building 55 simple 10-wheel freight engines and six Pacific type passenger engines, which will be equipped partly with the Schmidt and partly with modified Schenectady and other types of smoke-tube superheaters, and a number of other roads are also experimenting with this system, which is therefore fairly well started, experimentally, and is now in sufficiently extensive use to develop its troubles in regular service, and emerge from the nursing stage, which always engenders the suspicion that particular attention to one engine's performance may obtain results that would not be realized from a number.

Theory.

When water is converted into steam, its temperature depends upon the pressure at which it is evaporated, and in steam, as it is commonly used in the saturated state, these quantities are absolutely dependent, to the extent that any further addition of heat to the boiler does not result in an increase in the temperature of the steam, but simply increases the amount of water evaporated, and conversely any abstraction of heat from the steam will immediately condense a portion of it. If, however, the steam, after being evaporated, is still further heated, it becomes superheated, and its volume increases in proportion to its rise in temperature. It is possible to heat steam in such a way that the volume remains constant and the pressure increases with the temperature, but this method cannot be carried out in a superheater, as the pressure is governed by the boiler with which the superheater is necessarily in communication, and consequently remains constant. The amount of heat required to raise the temperature of one pound of steam one degree under this condition, is the specific heat of steam at constant pressure and is not accurately known, although commonly stated to be 0.48, as determined by Regnault. More recent experiments have, however, assigned to it a higher value, and in an article in *Power* for August, 1904, G. A. Orrok analyzed the experiments of Grailly, Greissman and others and showed that it probably varies with the pressure, and that its instantaneous value equals 0.00222t —0.116, where t is the temperature Fahrenheit. This corresponds to a value of 0.65 at 350 deg. and 1.0 at 500 deg., and is slightly higher than the latest determination by Mr. Jakeman, of the British National Physical Laboratory, who found it to be 0.59 between 290 deg. and 420 deg. at 60 lbs. pressure, so that, allowing for a possible increase in the last figure with the temperature, a value of 0.7 may be assumed in connection with locomotive problems, and this figure will be used in this paper where not otherwise noted.

When superheated, steam behaves to a certain extent like a gas, its equation being $P V = 0.59276t$, where P is the absolute pressure in pounds per square inch, V the volume of one pound in cubic feet, and t the absolute temperature Fahrenheit, the constant being that derived by Schmidt. At constant pressure the volume thus varies directly as the absolute temperature, limited, of course, by the latter not being lowered below that of saturated steam at the same pressure, as in that case the superheat would disappear and the steam would commence to condense. The temperature can, however, be increased to any desired extent, with a

corresponding increase in volume, but without change in pressure, and this leads to two advantages, the possibility of obtaining a working fluid, which can be cooled without immediate condensation, and one which may be used at high temperatures without excessive pressure.

The first of these is of considerable importance, and is the cause of the greater part of the economy obtained by superheating. In the case of an engine using saturated steam, no heat can be abstracted from the steam to warm up the cylinder walls or steam passages without a sufficient amount of steam being condensed to furnish, by its latent heat of condensation, the heat required. This condensed steam is deposited over the entire surface in a finely divided state, and the larger portion of it remains as water until exhaust takes place, when, owing to the comparatively low temperature at which water is converted into steam at exhaust pressure, it is re-evaporated by absorbing heat from the cylinder walls, which by that time have attained a higher temperature than the exhaust steam. In the process of evaporation the water abstracts heat very readily on account of its close contact with the metal, and while being evaporated it can

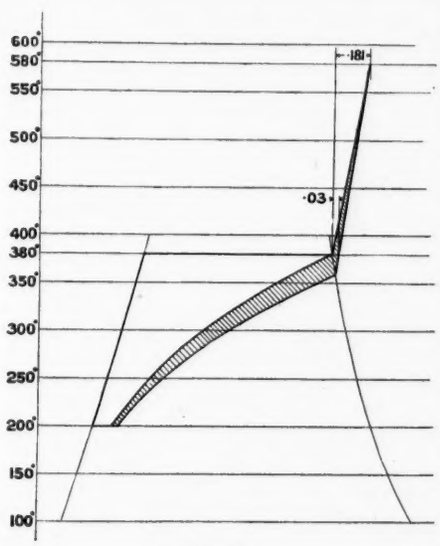


Fig. 2.

absorb a large amount of heat without its temperature being raised, about 950 B.t.u. for each pound converted into steam. In the case of an engine using a gas, where no condensation takes place, this interchange of heat is limited to a reduction of temperature during admission, and an increase of temperature during exhaust, of the gases in immediate contact with the walls, and since the heat required to raise or lower the temperature of a gas considerably is very small, the heat abstracted from the cylinder walls during exhaust is correspondingly less. Were one pound of gas the amount affected by this action, it would only require 50 B.t.u. to raise its temperature 100 deg., showing the vastly greater capacity of a film or scattered drops of water to change the temperature of the metal with which it is in contact. The evaporation during exhaust of the water condensed on the cylinder walls during admission is the means by which their temperature is lowered, and by avoiding its condensation, their variation in temperature is greatly decreased. Superheated steam, having a temperature higher than that corresponding to its point of condensation under any given pressure, can give up a portion of its heat to the cylinder walls without being condensed, and will, if the superheat be sufficient, avoid it entirely, thus approximating the condition of an engine working with a non-condensable gas.

In an engine operating with saturated steam, there is, in addition to that shown on the indicator diagram as present in the cylinder, a quantity of steam passing into the cylinder at each stroke, which condenses into water during admission and is re-evaporated during exhaust without performing any useful work; while, if sufficient superheat is employed to render the steam dry at cut-off, all the steam that has passed into the cylinder is that shown on the diagram, the heat absorbed by the cylinder walls being furnished by its drop in temperature in place of by condensation.

The question is treated with great clearness in the "Steam Engine, Theory and Practice," by William Ripper, and some results from a small Schmidt engine, for which figures are given, exhibit the action that takes place very well. It was found that for each 1 per cent. of wetness or steam condensed at cut-off when working with saturated steam, it required 7.5 deg. of superheat in the entering steam to prevent any condensation up to that point. Thus in case 25 per cent. of the steam was condensed at the point of cut-off, in order for it to be dry at that stage, 7.5 × 25 or 187.5 deg. of superheat would be required. Supposing then it takes one pound of steam to fill the cylinder at cut-off, which would require for its production about 1,000 B.t.u., in the first case, since 25 per cent. of condensation took place, a total of 1⅓ lbs. was admitted, to produce which takes 1,333 B.t.u.; in the second case, in addition to the 1,000 B.t.u. to produce the steam, sufficient heat must be added to superheat it 187.5 deg., and as Professor Ripper takes 0.48 as the specific heat of superheated steam, this requires 90 B.t.u. additional. Since the work performed is practically the same in both cases, the heat required is thus 1,333 B.t.u. in the first case, and 1,090 in the second, or a gain of 22.3 per cent., and while these figures do not, of course, apply to every engine, they illustrate the reason for the economy that is obtained through the decrease in the amount of heat interchanged with the cylinder walls, which may be termed the economy due to temperature, as it is caused by the steam being at a sufficiently high temperature to prevent its being cooled without immediate condensation. In Professor Ripper's work, diagrams are given which are reproduced in Fig. 1, which show this interchange of heat, in the case of saturated, medium superheated, and high superheated steam respectively, and since this heat may be taken as wasted, they are interesting as showing the loss that is avoided. The shaded areas, showing the heat interchange, are drawn to the same scale as the indicator diagrams, so that their area shows the wasted work on this account in comparison with the useful work shown by the indicator diagram.

When steam is superheated beyond the point at which dry steam is present at cut-off, a still further gain occurs on account of decreased heat interchange up to the point where it is dry at release, which requires an increase in the superheat of from 50 deg. to 100 deg., according to the rate of expansion and other conditions, and in stationary practice, where an economical rate of expansion is invariably employed, superheating is rarely carried to this point. In locomotive work, however, engines are commonly worked at long cut-offs for considerable distances, and in such cases it is exceedingly likely, when the steam is considerably superheated, that superheat may occur at release. This is not a loss, as commonly stated, but is a gain due to the second advantage mentioned, that of a working fluid which may be used at high temperatures without excessive pressure.

The amount of work that can be performed by one pound of steam, whether used expansively or not, is very closely proportional to its P V, or absolute pressure multiplied by the volume of one pound of steam at that pressure, and since the amount of heat required to produce one pound of steam varies with its pressure and temperature, the P V divided by the heat of production is a measure of the economy with which work is obtained. In the case of saturated steam at 100 lbs. (abs) this quantity is 0.372; for saturated steam at 200 lbs. it is 0.383, and this improvement of 2.8 per cent. represents the gain in economy due to increasing pressure. Steam at 200 lbs. is slightly more economical than steam at 100 lbs. superheated to the temperature of saturated steam at 200 lbs., but as the pressure increases beyond that point the gain is very slight, as it depends largely on the temperature, and in increasing the pressure from 100 to 200 lbs., the temperature has only increased from 327 deg. to 381 deg., and there is no practicable increase in pressure that would give any appreciably higher temperature, as

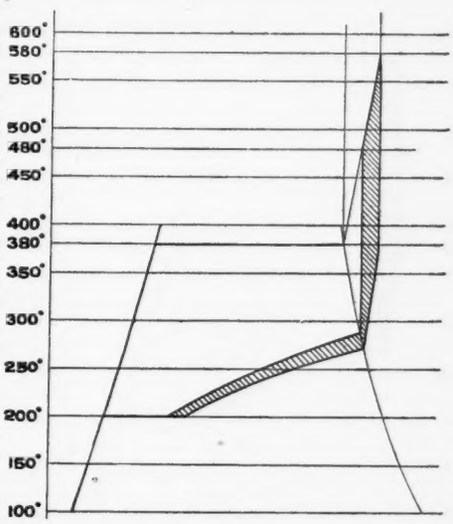


Fig. 3.

at 300 lbs. the temperature is only 420 deg. By superheating, the temperature, and consequently the volume, can be increased considerably without increasing the pressure; thus, for steam at 200 lbs. (abs) superheated 200 deg., the P V divided by heat of production is 0.425, a gain of nearly 11 per cent. by superheating. This gain, which may be termed the economy due to volume, as contrasted with the economy due to temperature, which acts through the reduction of cylinder condensation, is evidently most effective when steam is used non-expansively or at long cut-off, whereas, the avoidance of waste in the cylinders is not important under those conditions, but operates when the rate of expansion is greater, and considerable loss would occur in an engine using saturated steam. The economy due to volume is obtained through the increase in the volume of steam when superheated, which enables a given weight of steam to provide the volume required for a greater number of strokes of the engine, and it is evident that the economy from this cause commences when the steam is dry at cut-off, and continues when superheat is present at release. It is true that there is a loss in the latter case compared with the result that could be obtained if the steam were expanded

to saturation, but it is a loss of the same nature as that occurring when steam at 200 lbs. is released without expansion—a loss occurs, but it is still more economical to use steam at 200 lbs. without expansion than to use steam at 100 lbs. under the same conditions. In locomotive work the pressure is decided on from practical reasons, and the cut-off adjusted to perform the work required from the engine, and in such a case, if superheat occurs at release, there is a gain, not a loss, compared with an engine working under the same conditions, but without superheat at release. This question, which is of some importance, can be decided by the temperature entropy diagram, and Fig. 2 shows a diagram for steam at 380 deg. working without condensation, non-expansively, with and without 200 deg. of superheat, the shaded areas showing the work due to superheating. Fig. 3 shows steam at 380 deg., superheated 100 deg., adiabitically expanded until dry at release, also when superheated 200 deg. with the same rate of expansion, and correspondingly superheated at release, the shaded area showing the work done in the two cases. The thermal efficiencies have very kindly been worked out by Prof. R. J. Durley, of McGill University, and are 0.0754, 0.0825, 0.1332 and 0.1386 respectively, thus showing a gain in the first case of 9.4 per cent. and in the second of 4 per cent. due to the superheating. Consideration will show that the change in the location of the constant volume line is responsible for the increase and this is caused by the greater volume of superheated steam.

The conclusions to be drawn from these results are that, in locomotive work, should conditions be such that superheat occurs at the exhaust, no loss, but, on the contrary, a gain, is obtained; that this gain, while very valuable at long cut-offs, becomes of less importance as the cut-off is shortened, and a more important economy is then obtained through the voidance of cylinder condensation. Since the economy obtained from volume is only 10 per cent., with a superheat of 200 deg., under favorable conditions, while that obtained from temperature may amount to 25 to 30 per cent., the latter is by far the most important, and while economies may be obtained at long cut-offs, the greatest will occur with expansive working. The degree of superheat is not limited by theoretical considerations of cylinder economy, but the gain obtained would be comparatively less when carried beyond the point where the steam is dry at short cut-offs, and such a condition would require about 200 deg. to 250 deg. of superheat in the steam chest. Up to that point, from the point of view of engine efficiency, it is advantageous to obtain as high a degree of superheat as possible.

(To be continued.)

The Mexican Central Wharf at Tampico.

Tampico, the largest port in volume of traffic in Mexico, is situated on the Panuco river, about six miles from its mouth. The Panuco flows into the Gulf of Mexico about 250 miles below the mouth of the Rio Grande, the southern extremity of the United States. Tampico has been an important port for generations, but its growth was greatly retarded by inaccessibility, on account of the bars at the mouth of the river, and by lack of facilities for handling the large volume of business. The Mexican Central Railway has lines running to Tampico from Chicalote, a point on its main line about 400 miles west, and from Monterey, 388 miles northwest, and has begun building a third line direct from the City of Mexico, about 280 miles due south, to the same port. Tampico is therefore an important point for the railroad.

In 1890 the Mexican Central, under contract with the Federal Government of Mexico, built stone jetties at the mouth of the Panuco in order to remove the obstructing bars and furnish a safe passage for ocean vessels of deep draft. This work, done under E. L. Corthell, M. Am. Soc. C. E., was very successful and maintains a channel about 28 ft. deep over 500 ft. wide. The usual range in tides is only about 15 in., a matter of great importance to maritime commerce. A fine custom house, and along its front a creosoted timber wharf, was built at Tampico in 1897, but the wharf caught fire just as it was completed, and was burned to the water line. Of course the creosoted piles were uninjured below the water line, and these were considered in a subsequent study for a new wharf.

During the years 1900 to 1902 inclusive, the Mexican Central, under contract with the Mexican Government, replaced the burned wharf with a finely equipped, steel-concrete, fireproof wharf, at which the largest vessels can land.

The following description is taken from a pamphlet published by Mr. E. H. Conner, Assistant Engineer of the work:

In July, 1898, the Mexican Central employed Mr. A. J. Tullock, of Leavenworth, Kan., M. Am. Soc. C. E., to investigate and report on the subject of a fireproof wharf. Mr. Tullock selected Mr. Alfred Noble, of New York, M. Am. Soc. C. E., as consulting engineer to aid him in this work. An engineering party was organized and sent to Tampico to make borings and carefully investigate the conditions existing there. Careful study was also made at the same time of wharves built in this and other countries, and of the various features governing their design. Fifty-one deep borings were made, ranging from 60 to 100 ft. Fine silt or mud was found to a depth of about 50 ft. below mean high water, and underlying the silt, clean fine sand. Many tests were made to determine the supporting power of piles driven in this material. Three designs of wharf were recommended by the engineers in their exhaustive report, in the following order as to merit.

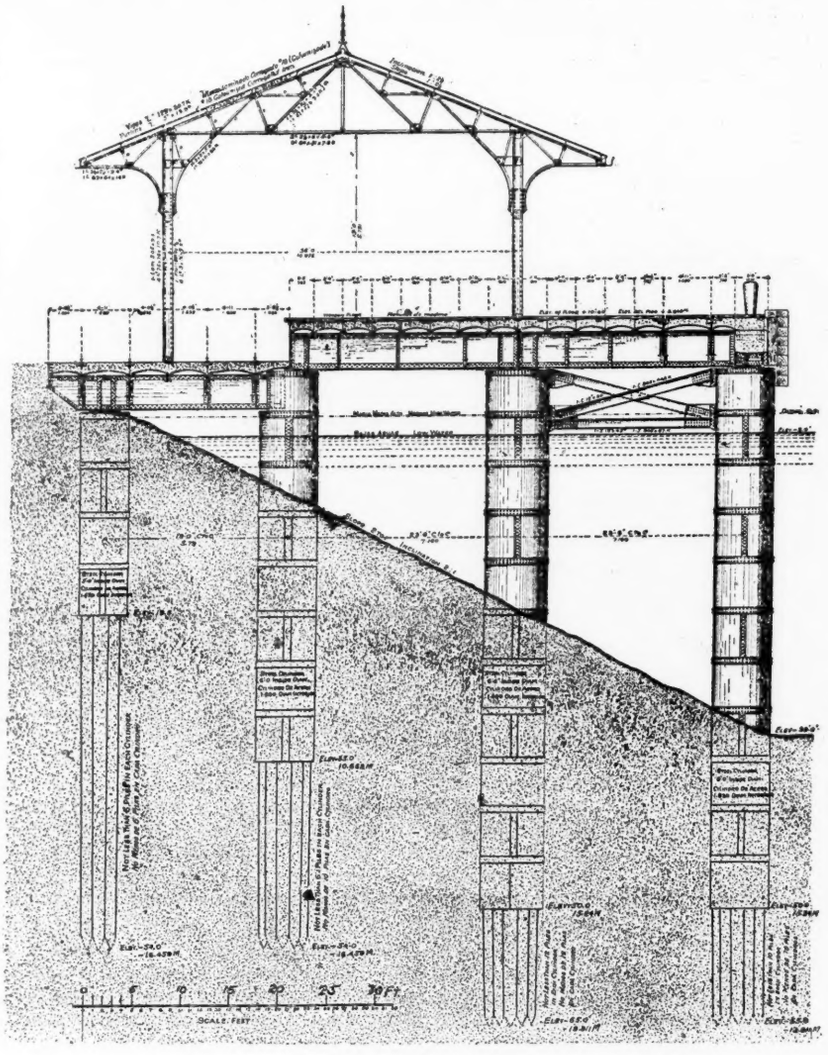


Fig. 1—Cross Section of the Mexican Central Tampico Wharf.

(1) A concrete quay wall extending along the face of the wharf its entire length with earth fill between the wall and the custom house. The concrete wall to rest on pneumatic caissons sunk into the clean sand.

(2) A superstructure of steel beams and concrete arches resting on steel cylinders with piles driven inside and filled with concrete.

(3) A superstructure of steel beams and concrete arches resting on cast-iron water pipe sunk around the piles of the old wharf and filled with concrete.

Design No. 2 was approved by the Mexican Government as best combining the properties of supporting power, durability and economy. Design No. 1, would have cost

much less for maintenance, but the original cost was estimated at about twice that of No. 2. Design No. 3 did not possess sufficient supporting power to carry loads desired, or if made strong enough, possessed no economy.

A concession to build the wharf was granted the Mexican Central in December, 1899, and final approval of the plans and estimates given in February, 1900. Mr. Tullock was made Chief Engineer to prepare plans and superintend the construction and all work

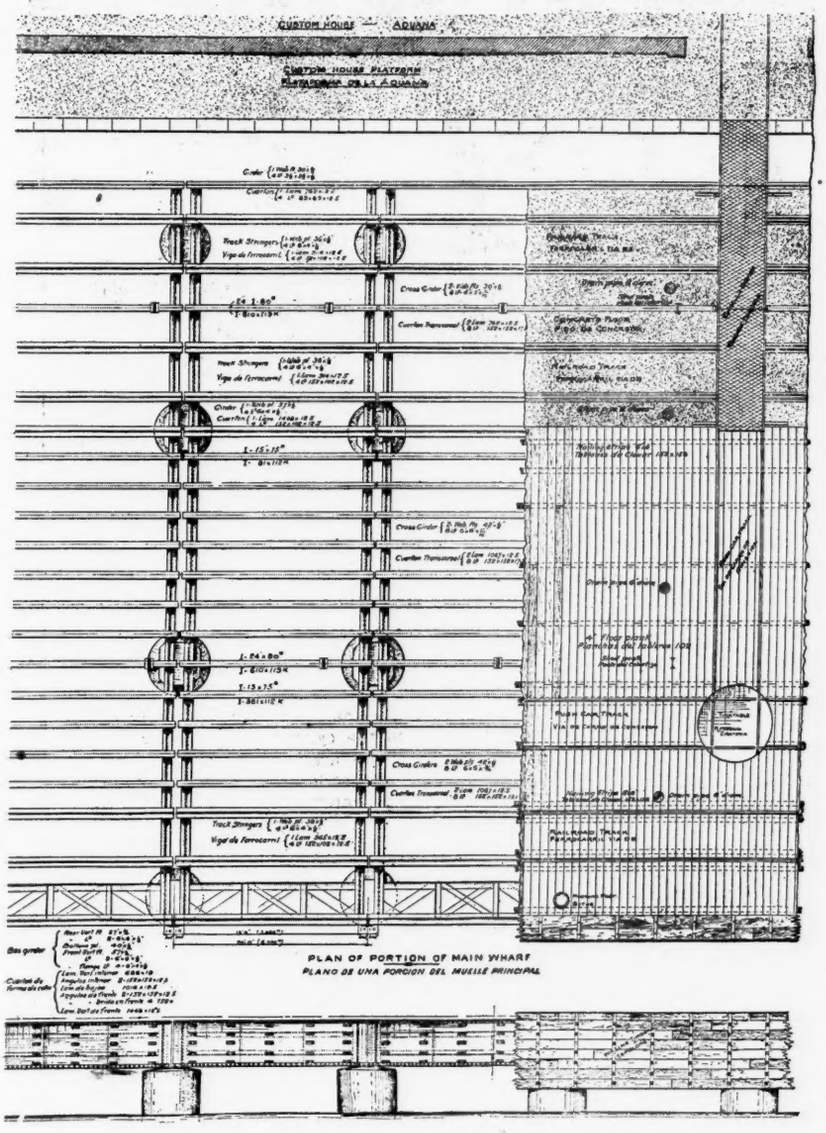


Fig. 2—Floor Plan of Part of the Mexican Central Tampico Wharf.

was done under his direction. Mr. Noble continued to act as Consulting Engineer. Mr. A. B. Ross, M. Am. Soc. C. E., was Resident Engineer in direct charge of the work.

Description.—The entire wharf is 2,600 ft. long. It is divided into the main wharf and two lateral wharves. The main wharf lies directly in front of the custom house and extends 100 ft. beyond it at each end. It is 1,200 ft. long by 75 ft. wide, and is partly covered by a steel shed 993 ft. long by 54 ft. wide. At each end of the main wharf is a lateral wharf 700 ft. long and 50 ft. wide. The lateral wharves are 3 ft. lower than the main wharf, to accommodate smaller vessels, with a grade of 4 per cent. connecting them to the main wharf. All portions of the wharves are designed to carry a minimum live or superimposed load of 800 lbs. per sq. ft. The dead load is 200 lbs. per sq. ft. on the front portion of the main wharf—50 ft. wide—and 150 lbs. elsewhere.

A standard gage railroad track runs the entire length near the front with turnouts on the lateral wharves connecting with tracks on ballasted creosoted timber trestle approaches from the shore. The rear portion of the main wharf, 25 ft. wide, is 4 ft. 5 in., or about the height of a car floor, lower than the front, and two standard gage tracks run on this low portion parallel to the wharf, thus making it easy for loading or unloading cars. The floor of the custom house back of the wharf is level with the front portion of the wharf. A push car track also runs the entire length of the main wharf, about 22 ft. from the face, with turntables for tracks running into the custom house. All members supporting standard-gage tracks are designed to carry a locomotive, weighing with tender, 139 tons, and having 88 tons on four pairs of drivers, Mexican Central Railway Specifications, 1898.

Main Wharf.—The main wharf is supported by 61 bents of four cylinders each, or 244 cylinder piers. The cylinders in each bent are spaced 23 ft. 6 in., 23 ft. 6 in. and 19 ft. apart respectively, from the front, and the bents 20 ft. center to center. All piers are made of steel shells with piles driven inside of same, and filled with concrete. The steel plates forming the cylinders are ½ in. thick, except in the upper 15 or 20 ft., where they are ⅝ in. thick for additional protection, where the action of the elements is greatest.

The cylinders in the first row, that is, along the face of the wharf, are 6 ft. in diameter by about 55 ft. long. In the second row, 6 ft. 6 in. by 55 ft., in the third row, 6 ft. by 40 ft., and in the fourth or rear row, 5 ft. by 21 ft. The last do not rise as high as the three other rows by about 4 ft., on account of the lower floor elevation at the rear of the wharf. The channel of the river in front of the wharf is 30 ft. deep at low water and the river bed slopes uniformly upward from the front to about the top of the rear cylinders.

The cylinders were all made in sections 5 ft. long, butt-jointed and riveted together. The creosoted piles extend below the cylinder shells distances of 15 ft., 15 ft., 20 ft. and 34 ft., and above the bottom of the shells into the cylinders 27 ft., 27 ft., 16 ft. and 10 ft. respectively, in the four rows beginning at the front. In all cases they go through the silt into the clean sand.

The two front rows of cylinders are braced transversely by steel cross frames about 6 ft. deep, riveted between them. The maximum loads carried by the cylinders on the caps are respectively 150, 235, 184 and 116 tons. A heavy cast-iron wall plate is partly imbedded in the concrete in the top of each cylinder to support the girders. The steel used was open-hearth of medium grade, as that resists the action of salt water better than Bessemer. The piles were creosoted long-leaf yellow pine. Around and between the piles was deposited concrete composed of one part cement, two parts sand, and four parts small stone. The 4 ft. immediately above the piles, and the top 3 ft. except 6 in were filled with concrete of one part cement, two parts sand and four parts broken stone. The remaining portion was filled with concrete of the proportions one, three and six. The top 6 in. was made of mortar, one part of cement to two parts of sand.

From the numerous tests made during the preliminary investigations, the following factors were considered safe and used in designing the piers:

	Lbs. per sq ft.
Bearing on sand 50 ft. below water level	10,000
Bearing on silt	4,000
Friction in sand on sides of piles & cyl'drs	450
Friction in silt on sides of piles & cylndrs	200

In estimating the load on foundations, the weight of the displaced water was deducted, but the weight of the displaced earth was not. Tests made, since the piers were completed, by loading with pig iron, confirm the safety of these assumptions.

Cross girders rest on the transverse rows of cylinders. These cross girders in turn support longitudinal girders, carrying the concrete floor. On account of the great shear and necessary shallow depth, each transverse girder is composed of two single plate-girders, connected by diaphragms, the space between the two girders being filled with concrete.

The ordinary longitudinal girders are I-beams 15 in. by 75 lbs., spaced 3 ft., center to center. The girders supporting the shed columns are 24 in. by 80 lbs., and those under the railroad tracks are built of one web plate 38 in. by ½ in., and four angles 6 in. x 4 in. x ½ in. These latter are designed in accordance with the Mexican Central Railway Specifications, of sufficient strength to carry their standard locomotives.

A box girder 42 in. wide by 27 in. deep runs along the face of the wharf. This is built up of solid web plates ½ in. thick,

front and rear and bottom, all connected by 6 in. x 6 in. angles, and is filled with concrete. The face girder of this box girder, which also supports the timber waling pieces, running along the face of the wharf, is 57 in. deep, with ½ in. web plate, and four flange angles 6 in. x 6 in. x ½ in. The timber waling pieces 12 in. x 12 in., are securely bolted by galvanized bolts and straps to the face girder in such manner that they can be easily removed. The timbers and box girder are designed to take the wear and tear and blows of vessels, lying alongside of or crowding against the wharf. This thrust is very great during high winds, as the entire wind force acting on a large vessel, may bear on the wharf over a very short distance. Particular attention was given to the horizontal shear on these girders. Longitudinal girders built of plates and angles are also placed at the rear of the wharf, and at the line of change in the floor level, which girders serve as a finish for the floor, and also as longitudinal bracing.

Corrugated-iron arches to act as forms were sprung between the longitudinal beams, and the concrete floor filled in on top of same, up to the level of the tops of the beams. The minimum thickness of concrete is 10 in. at the centers of the arches. This concrete is composed of one part Portland cement, three parts sand, and five parts broken stone. The top and bottom inches are made of mortar, one part cement and one part sand. Nailing strips 6 in. x 6 in. are imbedded in the concrete about 6 ft., center to center, and the entire wharf is covered with a wearing surface of plank, 4 in. thick, laid perpendicular to the face of the wharf, and fastened to the nailing strips with 8-in. lag screws. Wooden strips 5 in. x 12 in. were bolted to the tops of the railroad stringers, and to these are bolted the rails, with bolts extending through the top flange of the stringers, and cast washers gripping the flanges of the rails. The top of the rail is level with the top of the floor plank. All timber is long leaf yellow pine, creosoted with 16 lbs. of oil per cu. ft. No metal less than ½ in. thick was used, on account of the severe action of salt air. To provide for expansion, sliding joints or connections were made for the longitudinal girders at every third bent, or 60 ft. apart. Openings 2 in. wide were left in the concrete floor at these bents and filled with asphalt.

A steel shed 54 ft. wide by 993 ft. long was built on the main wharf directly in front of the custom house. It has steel columns, trusses and purlins, and is covered with No. 18 galvanized, corrugated iron. The columns are spaced in two rows, 36 ft., center to center, and 18 ft. apart in each row, making 55 panels. The trusses overhang the columns about 9 ft. on each side. The shed is open on all sides. The columns are braced longitudinally by ornamental struts, and similar ornamentation is placed at each end of the roof. An ornamental cresting runs the entire length on the ridge.

An overhead foot bridge (Fig. 3) is provided at the west end of the custom house for the exclusive use of foot passengers. This viaduct connects by stairways with the first and second floors of the custom house, and at the other end is located a tower for the use of the Customs Inspector, from which tower can be seen the entire length of the wharf, and all vessels lying there. A broad stairway also leads from the viaduct to the floor of the wharf.

The low portion at the rear of the wharf is crossed by several bascule bridges, carrying push-car tracks, which run from near the face of the wharf into the custom house. These bridges are built in two panels, each about 13 ft. long, hinged at the end and fold up between the shed columns located between the two tracks. They are operated by hand power by means of chain hoists.

Lateral Wharves.—These are similar in construction to the main wharf, but are, as before stated, lower and only 50 ft. wide. They extend 700 ft. east and west from each end of the main wharf. The cylinder piers are all 6 ft. in diameter, arranged in three longitudinal rows, 19 ft. 3 in., center to center, the cylinders in each row being 20 ft. apart. The lengths of the steel shells are 53 ft., 48 ft. and 48 ft. respectively, from the face. The piles driven inside of the cylinders extend in all cases 15 ft. below same into the clean sand. The piles project up into the cylinders 26 ft. to 27 ft. The steel plates are ½ in. thick, except in the upper 5-ft. sections of the two front rows, and the two upper sections of the rear row, where the plates are ⅝ in. thick.

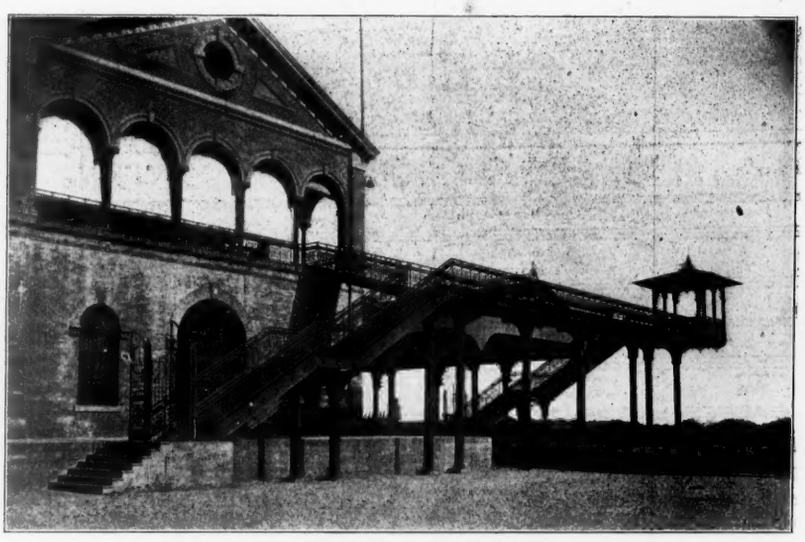


Fig. 3—Overhead Bridge for Foot Passengers.

Fig. 4—Cylinder-Sinking Traveler, No. 1

The steel superstructure girders, concrete floor and timbers are arranged much the same as in the main wharf, but on account of the shallower permissible depth, due to the lower elevation of the floor, the longitudinal girders frame into the cross girders instead of resting on top, and all girders are made of very heavy I-beams. The cross girders each consist of three I's, 24 in. by 95 or 100 lbs. The regular longitudinal stringers are I's, 18 in. by 60 lbs., and the railroad stringers 24 in. by 100 lbs. There are no sheds on the lateral wharves. Heavy iron mooring posts and rings are securely bolted to the cross girders along the face of the entire wharf 60 ft. apart.

The shed is provided with copper gutters and down spouts at every other post, and the wharf has frequent drainage holes over the entire area. It is lighted by 16 arc lamps, supplied with current from the electric light plant of the custom house. Thirteen hydrants with 2½-in. outlets, located along the inner face of the wharf for fire protection, are supplied with water through an 8-in. main, connecting with the custom house water system.

In the construction of the wharf and auxiliaries, approximately the following material was used: 217,000 lin. ft. of creosoted piling, 2,000,000 ft. of creosoted pine lumber, 25,650 cu. yds. concrete, 10,000 tons of steel, 90 tons of rivets, 280 tons of corrugated iron, and 7,700 gals. of paint. The total area of the wharf is about 129,000 sq. ft. The storage capacity, not including the car capacity

of the tracks, is 34,250 tons. The total length of cylinder piers in place is 20,800 lin. ft.

Equipment and Construction.—On account of the size of the work and the distance from well-equipped machine shops, it was deemed advisable to provide a very complete equipment for this work. The following buildings were erected for construction purposes:

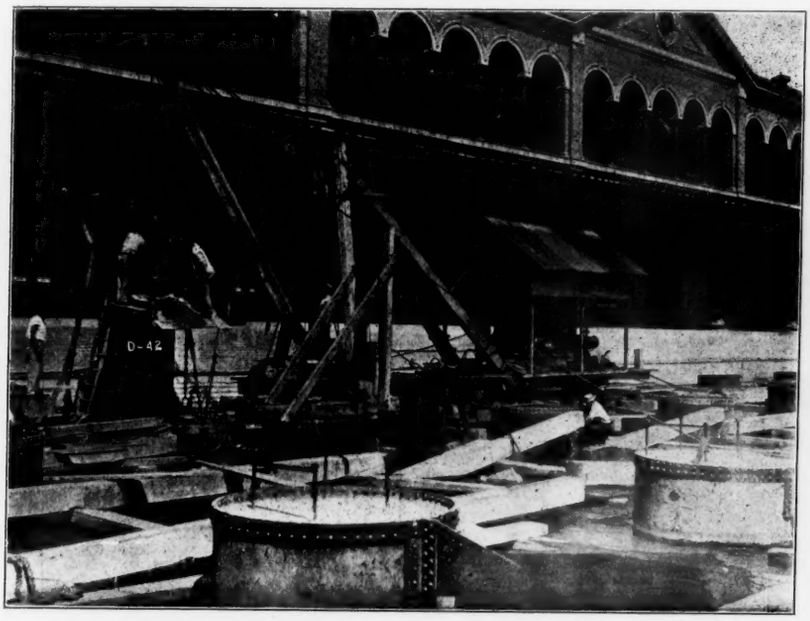


Fig. 5—Sinking Short Cylinders of Inner Row of Main Wharf.

Office building, 14 ft. x 40 ft.; machine shop, 48 ft. x 144 ft.; general store house, 24 ft. x 80 ft., for the storage of all small supplies; cement house, 18 ft. x 96 ft., divided into store room, 18 ft. x 84 ft., with a storage capacity of 1,500 barrels of cement; and testing laboratory, 18 ft. x 12 ft., containing complete equipment for determining the physical properties of cement. In the machine shop were located a low-pressure pneumatic plant with a capacity of 720 cu. ft. of free air per minute, for use in connection with air-lock work, a high-pressure pneumatic plant with capacity of 420 cu. ft. free air per minute for operating pneumatic tools, electric lighting plant of 100—16 c.p. lamps capacity; a water service pump, lathe, drill press, pipe cutter, bolt cutter, 60-in. bending rolls, combined punch and shear, grindstone, emery wheel, rail cutter, circular wood saw and well-equipped blacksmith shop. A line of water and air pumps extended from the machine shops along the shore side of the wharf, with numerous outlets and connections for pneumatic work.

The floating plant consisted of five barges, 24 ft. x 60 ft. x 4 ft., two barges 16 ft. x 55 ft. x 4 ft. two barges 16 ft. x 45 ft. x 4 ft. for use in transporting construction materials, one combined derrick and pile-driver barge, 24 ft. x 70 ft. x 4 ft., one pump barge, 20 ft. x 45 ft. x 4 ft., and a tug for towing purposes chartered from the Mexican Central. Additional traveling derricks and hoisting engines for sinking cylinders, driving piles, concreting and erecting superstructure are referred to later, under the description of the different operations of construction.

A system of push car tracks connected the various parts of the work with the material yard, machine shops and store houses. The cement, crushed stone and sand were delivered at the work on cars. Cylinder sections, piles, timber and superstructure metal were delivered by lighters. All materials were delivered at the point of expenditure on barges, except bolts, corrugated iron and light materials, which were delivered on push cars.

The present main wharf occupies about the same location as the burned wooden wharf, and the old wharf piles were used for supporting staging carrying the various travelers used on the work. The piles were cut off to uniform level, capped with 12 in. x 12 in. timbers, which carried four lines of 12 in. x 12 in. track stringers. To these were spiked 56-lb. rails, on which the different travelers for construction purposes were operated. The staging for the rear range of cylinders was entirely separate from the staging used for the three front ranges. Fig. 4 shows a photograph of the traveler used in sinking cylinders in the three front ranges of the main and lateral wharves. Two of these travelers were used throughout the work. Each was provided with two hoisting engines and three derricks, so arranged that the various operations connected with sinking could be carried on in three cylinders of a bent at the same time. The cylinder sections being brought to the bent on barges, two or three sections, according to the depth of water at place of sinking, were riveted together on the barge, then set in position, and held in place by large wooden clamps attached to the staging. The cylinders were then forced down by pull jacks, and when these were not sufficient, were driven by a short blow of a 1,500-lb. hammer, working in short leads, placed on top of the cylinders. The material inside of the cylinders was excavated by means of Lancaster grapple dredges.

For sinking the short cylinders of the inner row of the main wharf, the plenum pneumatic process was used to avoid any movement of the sub-soil near the foundations of the custom house, and also on account of the mass of riprap deposited along the outer edge of this foundation. For this purpose an air lock of proper size to bolt to the top of the cylinders and a small traveling derrick operating on a standard gage track were used. (Fig. 5.) The excavated material was hoisted out by a bucket attached to a wire, passing through the top of the air lock.

After the cylinders were sunk to the proper position, from ten to twelve 45-ft. creosoted piles were driven inside of each cylinder. For this purpose, a swiveling pile-driver was erected. This driver was arranged so that it could be turned completely around on its center, and also arranged on a shifting or transfer table, that allowed it to be transferred from one range of cylinders to another. This transfer table ran upon the same four tracks used by the sinking travelers, and followed in operation immediately behind them. The pile driving machinery consisted of a steam hammer, No. 2 Warrington patent. An ordinary No. 172 Lidgerwood hoisting engine supplied steam for operating the hammer and for the various operations of the driver in handling the pile. It was found, however, that in continuous operation, the boiler was of insufficient steaming capacity, and was therefore supplemented by a boiler from a No. 72 Lidgerwood engine. To drive the piles until the butts were at the required elevation, it was necessary to use a 30-ft. oak follower, to one end of which was attached a 14-in. wrought-iron pipe, ½ in. thick, and 6 ft. long, which fitted over the top of the pile.

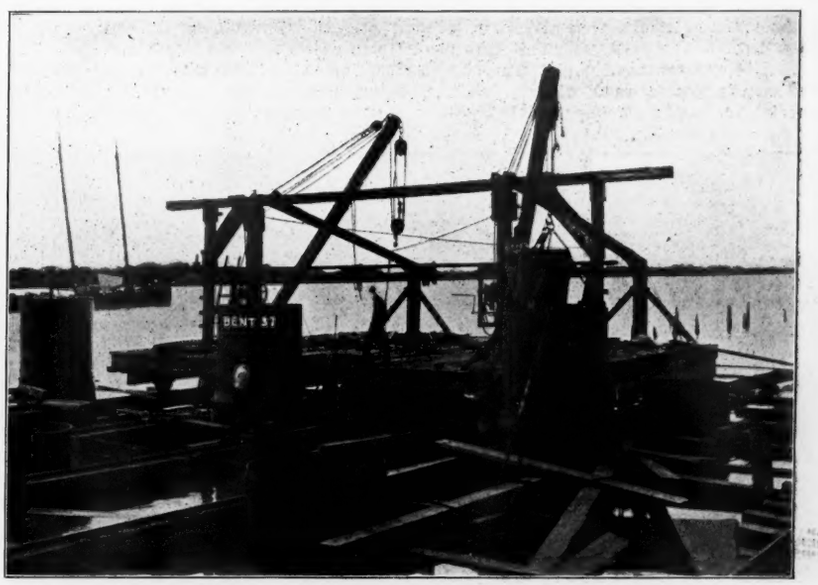


Fig. 6—Traveler Platform for Concreting Cylinders.

For driving the piles in the cylinders of the inner row of the main wharf, ordinary pile leads with a 2,500-lb. drop hammer were used, the pile-driver traveling on rollers on skidways immediately over the tops of the cylinders. Following the pile-drivers, and

on the same tracks was a traveling platform used in concreting the cylinders. (Fig. 6.) It was built for operation in concreting the cylinders of the main wharf, and consisted merely of a traveling stage gear surmounted by a platform 40 ft. x 53 ft. It was arranged and originally intended to cover two bents of cylinders, was well roofed over to keep the concrete material dry, and also to allow continuous working during rainy weather. The front part of the platform was supplied with two derricks, operated by hand winches for the special purpose of placing and removing the cylinder air locks, used in pneumatic placing of concrete. The concrete traveler was operated in this way from bent 36 to bent 52, after which it was found unessential to use the air lock in sealing the cylinders. They could be sealed sufficiently tight by placing through a tremie the 1:2 mortar about 5 ft. in depth, two or three days prior to the pumping out of the cylinders. The traveling platform was therefore increased in length so as to cover three bents of cylinders, making a working platform 53 ft. by 53 ft., thus allowing the sealing with mortar of one bent, the pumping out of another bent and the placing of the main body of concrete in the third bent, all operations being carried on at the same time. When the cylinders of all ranges of the main wharf had been completed, the concrete platform was changed to suit the gage of tracks of the lateral wharf.

It was found that although the cylinders were excavated to the cutting edge, and usually below during the sinking operation, that after the piles had been driven in them they had refilled with sand 4 or 5 ft. Before the cylinders could be concreted, it was necessary to remove this sand, which was done by use of a long 3-in. siphon worked down between the piles. As soon as the sand was cleaned out, sufficient 1:2 mortar was placed by means of a tremie in the bottom of the cylinder 4 or 5 ft. deep. This mortar was allowed to set about 24 hours, when it was found that the cylinders were usually completely sealed at the bottom, and could then be pumped out, and the balance of the concrete laid in the open air.

For the erection of the superstructure, a traveling derrick was used, which is shown in Fig. 7. It was arranged with two strong derricks on the two forward corners, and a rear derrick for use in placing work left undone by the front derricks, and for placing the steel superstructure supported by the cylinders of ranges 3 and 4, or in that portion of the main wharf known as the low area. The operations of the erection traveler combined the placing of the steel with the pulling of all old wharf piles not previously pulled by the cylinder sinking travelers. The steel work was riveted together by pneumatic riveters.

After the steel superstructure was erected and riveted in place, arched corrugated iron was placed between the floor stringers and the concrete floor placed on top of same. To facilitate the distribution of concrete, the traveler shown in Fig. 8 was built. Concrete was mixed by hand on the barge adjacent to the face of the wharf, was shoveled into skips of about ⅔ cu. yds. capacity, and swung to place by the traveling derrick. This derrick would reach and pick up skips from the barges, and swing them to the extreme inner edge of the low area of the main wharf.

After the floor of the main wharf was concreted, the steel for the shed was delivered and distributed over it. An erecting platform or traveler was built for the erection of the shed. This traveler was of very light construction, well braced, and arranged to run on two standard gage tracks, one on the low area, and the other near the face of the wharf. The base over each track was made of elongated push car trucks, and the upper platform laid about 2 ft. below the lower members of the roof trusses. It was decked over, and arranged to carry temporary platforms projecting outside of the shed posts. This traveler proved of great utility in the erection and riveting of the shed, columns and trusses, and galvanized-iron roofing; also in painting the inside framework and roofing.

For placing the timber waling along the face and ends of the wharf, a small traveling derrick running on the permanent standard gage track along the front of the wharf was used. It was equipped with a double action, double drum hoisting windlass, operated by hand, and an extension beam sufficient to afford stability while lifting and placing the heavy timbers. The timber waling and traveler are shown in Fig. 9.

Fig. 7—Superstructure Erection Traveler Pulling Old Piles.

Fig. 8—Superstructure of Main Wharf.

During the preliminary work on the wharf careful and exhaustive research was made in the subject of the best coating for metal in salt water, and it was decided to coat the cylinders in the piers with Assyrian asphalt, applied to the metal while both the metal and asphalt were hot. At first the cylinder shells were so coated, but after being placed in the work gave evidence of peeling, and complete failure as a protective coating soon occurred, due partially to rapid deterioration caused by salt water, and disintegration caused by the growth of shell fish. Experiments were then made with various paints, but the time was too short to make any satisfactory tests. The balance of the cylinders of the main wharf were painted with Smith's durable metal coating. The cylinders of the lateral wharves were painted with L. Z. Leiter's air-drying paint, with the exception of the two upper sections of all piers, which were galvanized. The paint at the water line has not proved satisfactory, and it would have been better to have galvanized all sections of cylinders above low water. The metal work of the floor system and shed was painted with L. Z. Leiter's air-drying paint and Smith's durable metal coating. The shed was finished with Bessemer paint of a dark green color.

The two tracks of the low area of the main wharf, and turnouts from the track along the front of the wharf, are connected with the yards of the Mexican Central by creosoted pile and timber approaches, with ballasted decks, at both ends of the wharf. The piles, 60 ft. long, were driven by the pile-driver used in driving the piles in the cylinders, arranged with an overhanging of 18 ft. and swiveled on a turn-table.

In order to make the wharf accessible to the largest ocean-going vessels, it was neces-

sary to increase the depth of the channel in front of the wharf. Investigation showed that it would be necessary to dredge about 250,000 cu. yds., in order to make the Penuco river in the immediate vicinity of the wharf navigable for vessels of 25-ft. draft. An examination of the various dredges used at Vera Cruz was made, and also correspondence was entered into with several dredging firms in the United States, but no satisfactory arrangements could be made for this small amount of work, and operations were finally begun with a dredging outfit constructed from the plant used on the wharf. A traveling derrick was built running along the face of the wharf, and two floating derricks, operating on barges, were also used. Later a second derrick was operated along the face of the wharf. All had grapple dredges, and loaded the material on barges with sloping decks and hinged sideboards. The material was taken to the opposite side of the river and dumped close to the shore. The unloading was facilitated by means of a pump and water jet.

In order to maintain the depth of water along the face of the wharf, pile dykes were constructed, one projecting into the river from the north shore just above the wharf, and the other from the south shore a considerable distance above the wharf. The former extended into the river only as far as the face of the wharf, and prevented the water from cutting in behind same. The latter deflected the current from the south side of the river toward the face of the wharf.

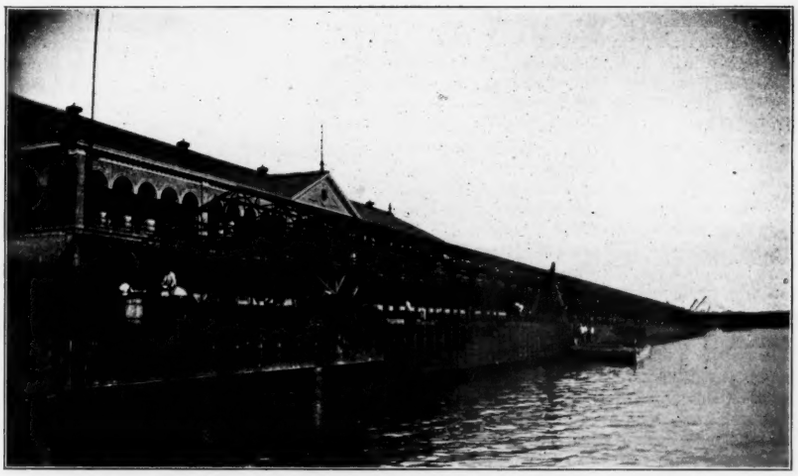


Fig. 9—Timber Waling, Main Wharf.

The construction of the two dykes is similar. Two rows of piles were driven staggered so as to make triangular panels of about ten feet. The piles were capped and connected by longitudinal string pieces. Planking 4 in. x 10 in. was then bolted to the up-stream side to check the flow of water and turn the current toward the face of the wharf. The piles were sway-braced in both directions. On account of the tide, the current in the river at this point is extremely variable, at times during the flood season being very great, and at other times during high tide, in the dry season, almost nothing.

Oil Pipe Line from Kansas to New York.

The last length will soon be laid in the 8-in. pipe line from Kansas City to Whiting, Ind., completing the Standard Oil Company's direct outlet to seaboard for the Kansas-Indian Territory oil. The construction of the line was begun last September. It will furnish an outlet for the 6,000,000 barrels of oil stored in tanks at Caney, Neodesha, Ramona, and Rantoul, Kansas, as well as for the surplus of oil not now taken care of by the refineries at Kansas City and Neodesha.

The oil field is stagnant, so far as drilling new wells is concerned. The production, which is around 25,000 barrels daily, comes from the open wells, but there is little encouragement to pump them. Low-grade oil is selling as low as 17 cents a barrel, and the best brings only about 50 cents. It is understood that the Standard is preparing to build 150 tanks of 35,000 barrels' capacity each for the purpose of storing this low-priced oil. When the state refinery and the independent refineries start, they will meet a competition backed by vast quantities of oil purchased at actual cost of labor.

The state refinery suit drags along in the courts, and it is possible that it will not be decided until fall whether the project is legal. One of the Supreme Court judges, however, said to-day that the court will try to settle the matter at the June sitting. Five new independent refineries are under way, and more will be built if their promoters can sell enough stock. Millions of dollars, however, are invested in oil stock, and none of it is paying a dividend, nor is it likely to do so for a year to come. If the cities within reach will take hold of the fuel-oil project heartily and install fuel oil-burners, there should be a fair outlet for the baser qualities of oil now a drug in the market.—*New York Evening Post.*

New Signals on the Lake Shore.

The Lake Shore & Michigan Southern is doing a large amount of signal work this year and has plans for rapidly extending the use of automatic signals throughout the main line from Buffalo to Chicago, about 525 miles. All-electric interlocking made by the General Railway Signal Company is being installed at the crossing of the Pittsburg & Erie at Erie, Pa.; at the crossing at Ashtabula, where the machine will control 209 functions; and at two places in East Toledo, Oakdale avenue and Fassett street. The Lake Shore already has this style of interlocking (the Taylor) in use at 13 places, the power at all of these except Chicago being furnished by gasolene engines.

All-electric interlocking of the design made by the Pneumatic Signal Company and installed last year at Philadelphia is being put in at Indiana Harbor, and the all-electric of the Union Switch & Signal Company is being put in at Millbury Junction, Ohio, and Whiting, Ind.

Up to about two years ago there was no automatic signaling on the Lake Shore except isolated sections scattered along the main line at obscure points. These sections aggregated about 40 miles, but the telegraph block system was maintained the same as though they did not exist. Now, automatic signals are in use from West Seneca, near Buffalo, to the P. & E. crossing at Erie, 80 miles; and there will soon be ready to put into service six miles more, from Indiana Harbor to 100th street, Chicago. This last is a four-track line. All of these signals are the Hall electro-gas semaphore. Signals of this type are now being installed from Buffalo Creek to West Seneca, seven miles. The Hall Company will have the contract for the new work to be put in from Erie to Nottingham, nine miles east of Cleveland, thus establishing the Hall system from Buffalo nearly to Cleveland, 183 miles. The Union Switch & Signal Company will have the contract for the automatic signaling from Nottingham to Chicago, with the exception of the six-mile section already installed and mentioned above, and a two-mile section mentioned below. All of the Union signals (semaphores) will be worked by electric motors. From Nottingham to Elyria, 34 miles, mostly four-track line, storage batteries will be used, both for working the signals and for the track circuits. This section will be the first to be completed. Probably most of the rest of the automotic signal work (west of Elyria) will have to go over until next year.

As fast as the automatic signal equipment is made complete, semaphore train order signals are to be put in at each station, and the time-honored Lake Shore signal, consisting of two arms (for movements in both directions) immovably joined together, will be abandoned. The new train order signals will stand normally at clear and there will be separate posts for eastbound and westbound movements. Each signal will control the nearest distant signal of the automatic system.

Between Oakdale avenue and Fassett street, East Toledo, the line (four-track) will be equipped with automatic semaphores of the direct-acting type recently designed by Mr. Dodgson, of the General Railway Signal Company. This signal has the motor at the top of the post, the arrangement being similar to that of the Herman signal, heretofore described in the *Railroad Gazette*, and now made by the General Electric Company, of Schenectady.

These signals will be "normal-danger," as will the Hall signals; but those put in by the Union Company will be "normal clear."

The general office building of the Lake Shore & Michigan Southern at Cleveland has been enlarged by the addition of one story, and the new floor will be occupied largely by the engineering department. The signal engineer's office will now have a very convenient and well-lighted testing room. This will be equipped with an ammeter and a voltmeter, and a switchboard by means of which the apparatus and materials undergoing test can be charged with current from 0 to 115 volts and 0 to 12 amperes. The current will be supplied by primary batteries, and the electric light circuit is also available. The room is supplied with an electric motor semaphore signal made by the Union Switch & Signal Company and an electro-gas semaphore made by the Hall Signal Company. These are for use in the instruction of inspectors and maintainers. There is a dark room 23 ft. long for the use of photographers and for testing colored glasses. This will be furnished with a Queen photometer and a Hoffman spectroscope.

By last winter's German time-tables, the longest run of a train without changing locomotives was 124 miles, between Nuremberg and Munich. By the summer time-tables it is 158 miles, between Berlin and Hanover.

The Master Mechanics' Convention.

The thirty-eighth annual convention of the American Railway Master Mechanics' Association was held June 14, 15 and 16 at the Oriental Hotel, Manhattan Beach, New York. In point of attendance it was the most successful convention in the history of the Association, the total registration being about 300 members, which is 15 per cent. higher than any previous record. President Peter H. Peck presided, and in his address took occasion to congratulate the members upon the change in the meeting place from the mountains to the seashore. In regard to the feeling that the two organizations, the Master Mechanics' and Master Car Builders' Associations, should be consolidated, he said that at a joint meeting of the Executive Committee of both organizations, held in New York last December, the subject was thoroughly considered; the advantages and disadvantages were carefully weighed, and it was the unanimous opinion of the members of both Executive Committees that nothing could be gained by any closer relations than now exist between the two associations.

Referring to the action at the last convention empowering the Executive Committee to procure a fund not to exceed $5,000 to be used under the direction of a special committee to conduct a series of tests and experiments concerning the values of varying proportions and dimensions of heating surface, grate surface and such other important features of boiler design as might, in the opinion of the committee, be found desirable, he said that the railroads had been asked to contribute and had responded liberally. There is now a fund exceeding $3,000 for use this year. Arrangements have been made for a locomotive of modern design; also the Purdue plant will be available in the fall.

In accordance with the action of the Association last year, whereby the constitution was modified to provide for representative membership, the necessary steps have been taken for the appointment of such members, and already the number of representatives appointed is very gratifying. By this method of procuring funds the Association will be enabled to carry to completion tests and experiments which will be of great value to the members and the roads they represent. He considered the Association seriously lacking in standards and said he saw no reason why a standard design cannot be made for a 17, 18, 19, 20 or 21 in. cylinder, also piston heads, packing rings, piston rods, cross-heads, driving boxes, shoes and wedges, eccentrics and straps, steam chests and covers. By adopting standards for these parts, long delays could be avoided in ordering for replacements. Delays and troubles were experienced before driving wheel centers were adopted as standard. Since their adoption manufacturers keep a stock on hand available for immediate use, and delays to repairs of engines are thus decreased.

He expressed himself as being adverse to the pooling of locomotives, his experience leading him to believe it not economical in either fuel, repairs or maintenance, especially on an ordinary-sized road.

The Secretary reported a present membership of 793, of which 738 are active, 17 associate and 38 honorary. Twenty-nine roads have appointed representative members in accordance with the constitutional amendment of 1904. The Treasurer reported a balance on hand of $15,535.

Messrs. Godfrey W. Rhodes and C. H. Cory were elected honorary members of the Association.

Messrs. Edouard Sauvage, Chief Engineer of the Western Railroad of France, and H. B. Howe, of the New South Wales Works (Australia) were present at some of the sessions and had the privileges of the floor extended to them.

During the convention, the *Railroad Gazette* having made known to the Executive Committee that it desired to publish under the supervision of a committee of the Master Mechanics' Association a dictionary on locomotive practice of a nature somewhat similar to the M. C. B. dictionary, the following resolution was adopted:

"Resolved, That the *Railroad Gazette* be and hereby is empowered to publish under the supervision of a committee of this Association an illustrated dictionary which shall give the proper names of each and every part used in the building of locomotives."

The committee named consists of Messrs. J. F. Deems, General Superintendent of Motive Power of the New York Central Lines; A. W. Gibbs, General Superintendent of Motive Power of the Pennsylvania, and A. E. Mitchell, Superintendent of Motive Power of the Lehigh Valley.

The amendments to the constitution proposed at the 1904 convention were adopted. These provided for the election of six executive members, who with the officers shall constitute the Executive Committee. The amendments covered Article 4, Section 1; Article 6, Section 3; and Article 8, Section 1.

The officers for the ensuing year are: President, H. F. Ball (L. S. & M. S.); First Vice-President, J. F. Deems (N. Y. C.); Second Vice-President, Wm. McIntosh (C. R. R. of N. J.); Third Vice-President, H. H. Vaughan (C. P. R.); Treasurer, Angus Sinclair (Loco. Engineering), re-elected; Members of Executive Committee for two years, C. A. Seley, G. W. Wildin and A. E. Mitchell; for one year, A. E. Manchester, J. F. Walsh and F. H. Clark.

The first paper presented was, "What should be the practice underlying the proper loading of locomotives on the basis of conducting transportation with the greatest efficiency and with least cost—considering all the factors individually?"

Mr. C. H. Hogan (N. Y. Central), Chairman of the committee, presented the report and said the members no doubt fully realized what a difficult matter it would be for a committee to prepare a satisfactory report on a subject of this nature. The committee was unable to secure a dynamometer car and other facilities in order to make a test such as should be made and therefore sent a circular letter to all of the members. It was the opinion of the committee that a dynamometer car should be used in making these tests and the train tests should be made afterwards to determine the resistances of curves and grades.

Mr. W. G. Wallace (D. M. & N.).—I think it would be well for the Association to recommend that locomotives should have an established rating that would permit proper train movement and avoid delays to following or opposing trains, lay-outs at meeting points, etc. The rating should be governed by the amount of traffic and the importance of the trains, and determined by the operating officer and the representative of the locomotive department, thus enabling all engines in service to produce the highest revenue. And as a fixed rating would not be applicable to the different conditions, the rating should be left to the respective officers of the road or division on which the locomotives are employed.

Mr. J. F. Deems (N. Y. Central).—I fully agree with what has just been said. This subject reminds me of the farmer who said he wanted to buy more land. When he was asked why he wanted to buy more land he said it was to raise more hogs. He was then asked why he wanted to raise more hogs, and he said it was because he wanted to be able to buy more land. In my opinion you could thresh this subject for the next four sessions, and at the end of the discussion you would be practically where you started.

Mr. H. H. Vaughan (C. P. R.).—I would like to hear some discussion as to whether the excessive lengths to which tonnage rating has been carried was really economical. It would be interesting to have information from a number of roads as to what percentage of the maximum tonnage that actually could be handled by the engines is being allotted to the engines on their road sheets. Such a comparison would show what these roads consider their economical tonnage. Provided an engine is not taking an excessively long time over a division, it appears to me economical to keep the tonnage up pretty high. Outside of roads where there is a considerable length of grade on a division, or a very heavy division, the heavier we load the engines the better, provided the transportation department is not causing undue delays in handling the traffic.

It would be interesting in connection with this report to ascertain if any roads are using definite reductions on account of the condition of their power; that is, whether it really is economical to shop an engine at a point where she begins to "fall down" on the tonnage, or whether it would not be profitable to put in a secondary rating for an engine which has made 75 per cent. of the mileage it could make, and give it a reduced tonnage.

Mr. G. R. Henderson.—There are two things which militate against conducting transportation at greatest efficiency and least cost. One is the fact that the schedule for time and tonnage loading is made up by the transportation department, very often without going into the matter thoroughly with the motive power department. I do not think as a rule the transportation officials have the information or data necessary to work up the load and speed combination needed to give least cost and greatest efficiency. The other point is that some high officials have an idea that there is nothing better than a high tonnage, and the superintendent who hauls the greatest number of tons usually receives commendatory letters; whereas another superintendent may be transporting his goods at a less cost per mile, and yet if his trains are lighter by say 10 or 20 tons, he may not get the complimentary letters which were sent to the other man.

Mr. F. H. Clark (C., B. & Q.).—I do not think as a general thing we pay enough attention to the broad question of the whole cost of operating trains. We do not consider, for instance, the wages of the trainmen as well as the wages of enginemen and the cost of coal. I think the economical rating is perhaps somewhat higher than what we have been accustomed to regard as an economical speed.

Mr. Edouard Sauvage (West. R. R. of France).—In France the general principles are as follows: First, as to the grade of the line. We do not take the actual grade, but a certain fictitious grade which is chosen according to circumstances. If there is a very short heavy grade, say 1 in 60 or 1 in 70, that is not taken into consideration in reaching the value of the grade of the line if the grade is short. If the grade is not short, of course it must be considered. So, we have a classification based on that fact. And then different lines are classified on account of the difficulties of hauling upon the ruling grade. When that is done the regular tonnage of each class of engine is fixed on each section of the line. That is not necessarily the maximum tonnage the locomotive can take, but it is the regular tonnage, and the locomotive department is not obliged

to take more. But in cases where they think it is possible to haul more—say the fireman or even the engine driver thinks he can haul more when the weather is fair and the engine is in good condition and when the quality of the coal is assumed to be good—then they may take extra weight; and they are incited to do that by a premium which they are allowed. There is a certain allowance of coal for engine drivers; and if they burn less there is a premium allowed to them for that economy. That is calculated for the regular weight, and again for extra weight cases, and in extra weight cases they have an extra allowance; but they are not obliged to do this when the weather is bad or there are any difficulties in haulage. There is a tendency not to have the engines rated too high in France. When the engine is rated too high the coal consumption goes up; so the ordinary rating is a moderate one, and they are allowed to take extra weight at times.

Mr. A. E. Manchester (C., M. & St. P.).—A method we have to determine the condition of the engine for performing its maximum work is by having the division superintendent keep a daily checking of the coal. The train despatcher receives for each train a ton-mileage statement when the train arrives at its terminal. He also receives from the motive power department a statement of the number of pounds of coal taken by that engine on that trip. He gets this statement almost as quickly as the engineer has got off his working clothes. He immediately puts that into figures of how much that engine has used per 100 tons hauled on that trip per mile. If the performance of the engine in the making of time or the consumption of coal on this trip is bad, a mark is placed against the engine; and if that same performance is repeated three or four times, then the motive power department is called on.

I believe a strong factor in the operation of trains is "the man behind the gun." He is interested or can be made interested in the economical performance of the work he is doing and when he understands that it is only by handling tonnage that he can make an economical showing for his engines and his division, he can be got into line.

Mr. F. M. Whyte (N. Y. C.).—Mr. Manchester has suggested that the engineer, fireman and the train crew could be made interested in the economical handling of their engine. A good way to do that is to pay them on a tonnage basis. We pay now on a mileage basis. That practice was followed in England, where at one time the enginemen were compelled to purchase their coal from the company—the coal used in freight service.

The brief report on Locomotive Tests at the St. Louis Exposition was next submitted. Mr. F. H. Clark, Chairman, read it, adding that the work of the committee was concluded at a meeting held in Philadelphia on the 12th inst. The material will all be in the hands of the printer in a few days, and as indicated in the report, the final report will be out in two or three months.

The individual paper on "The Value of Superheated Steam for Locomotive Work" was presented by the author, Mr. H. H. Vaughan, Superintendent of Motive Power of the Canadian Pacific. Mr. F. M. Whyte (N. Y. C.) asked the author's opinion of the amount of saving from the superheater.

Mr. Vaughan.—In the Schenectady superheater we obtained 10 to 15 deg. of superheat, measured in the branch pipe with a mercury thermometer. Our feeling is that that superheater is doing as well as our two-cylinder compounds. The other superheater (the Schmidt) gave 100 deg. additional superheat. I think we are justified in assuming that we have about 10 per cent. greater efficiency with the Schmidt than with the others. We have just made some tests in which we have obtained per mile the branch-pipe pressure and the degree of superheat; also we have measured the temperature of the gases coming out of the superheater tubes and the temperature of the gas coming out of the firebox to see how much heat we were wasting in the gases coming out of the superheater tubes.

Mr. Whyte.—If, as Mr. Vaughan says, there is a saving on the total coal bill of 10 per cent. per year, and that saving is made during the time steam is used in the cylinder, there must be a very heavy percentage of saving in the steam itself. Therefore, the draft on the fireman who is putting coal into the firebox is much less during the time that steam is used in the cylinder. The saving in the steam that is used in the cylinder must be about 25 per cent. in order to produce a saving of 10 per cent. in the total coal bill. This looks to me like one of the best ways of assisting the fireman.

Mr. Vaughan.—At the end of this year we shall have 106 engines in service equipped with superheaters. I think that we are getting as good or better results than we got out of the compounds. That is a great benefit. As a motive power man I would like to get away from the compounds. Our engines with the superheater have been the most successful from the roundhouse standpoint, and have had a great deal to do with the elimination of our water troubles. I intend as quickly as possible to turn over the engines from 21-in. to 23-in., and cut down the boiler pressure and see if we cannot get as good results with 160 lbs. as 200 lbs. pressure. If we can do that we shall save enough on the boilers to pay for anything we have to do in connection with the superheaters.

The report on Locomotive Driving and Truck Axles and Locomotive Forgings was presented by Mr. F. H. Clark, Chairman of the committee.

Mr. William Forsyth (*Railway Age*).—I understand this specification is similar to one which will be submitted to the American Society for Testing Materials this month. As a compromise specification it is in good shape for adoption and to be submitted to letter ballot by this Association, but I should like to see an addition or preface put before each of the specifications, to show that it is similar to those specifications which will have been adopted by the American Society for Testing Materials. I would therefore move that each specification have a preface showing that in essential features as to strength, chemical composition and excepting size of test specimen, this specification is similar to that adopted by the American Society for Testing Materials, June —, 1905.

The motion was adopted.

Shrinkage Allowance for Tires.—Mr. F. J. Cole, Chairman of the committee, presented the report, and at its conclusion read a letter from Mr. J. E. Muhlfeld (B. & O.), a member of the committee, in which he referred to certain omissions in the report, one of which was the use of retaining rings with drivers of large diameters and also with truck wheels. He thought the practice should be recommended. He said further: No mention has been made of the heating effect of brake shoes on driver and other tires. From our experience with various types of brake shoes and driver brake gear, we are of the opinion that the use of cast-steel shoes is not desirable, as we have had quite a number of cases where tires have been badly cut and overheated from the use of such shoes; and furthermore, we believe that when these shoes are used, and the tire runs toward the top of the shoe instead of toward its bottom, there is liability in the former case of tire being worn down to a proportionately smaller diameter than in the latter. This has been especially noticeable on mountain grades, where high rates of speed and severe braking action when descending grades tends to cause extreme friction and heating between the brake shoes and the tires.

Mr. A. E. Manchester (C., M. & St. P.)—We are experiencing more trouble with tires loosening on steel centered wheels than on cast-iron wheels. We use the split rim. It appears to me that the rim of our steel wheel has been too light. I started nearly a year ago to put on a heavier rim and also to change the form of the rim, going back in the direction of our old cast wheel. I believe that one of the causes for the loosening of the wheel is that there was a spring taking place in the felloe that gradually worked on the filling block and wore it away, causing the wheel to loosen. This has been noticeable equally with wheels having the retaining ring and without.

Mr. W. McIntosh (C. R. R. of N. J.).—I am of the opinion that the difficulty is more attributable to the light section of the steel wheel than it is to any difference between steel and cast-iron.

Mr. W. H. V. Rosing (Mo. Pac.).—I thought some of welding the rim sections together. I have not tried it yet, but propose to do it.

Mr. F. M. Whyte (N. Y. C.).—No doubt the centers were made too light. That has been demonstrated in one or two cases by measuring the wheel center before the tire was shrunk on, and measuring again after the tire had been shrunk on with a shrinkage of $^1/_{80}$ per ft., it being a parted wheel with cast-iron filling blocks. It was found that the rim was smaller in diameter, that the spokes had taken an S shape slightly, and that the dish of the wheel had been increased by $^1/_{16}$ in. Some tests made recently on the shrinking of cast-steel gears on extended wheel hubs 10 in. in diameter, showed that after the gearing had been shrunk on it would require 160 tons to remove the wheel from the axle, whereas the wheel had been put on at 32 tons.

Mr. J. F. Deems (N. Y. C.).—The subject should be referred back to the committee for further consideration, taking into account the whole question of the design of wheel centers, including that of the parted rim or solid rim. I make a motion to that effect.

Mr. C. E. Fuller (C. & A.).—Before the question of the shrinkage for tires on steel wheel centers is settled, the committee should redesign the steel wheel centers, increasing the spoke section and the rim section.

F. F. Gaines (Lehigh Valley).—I would like to make an amendment. That the subject of securing the tires to the large wheel centers be also considered.

The amended motion was adopted.

The report on Locomotive Terminal Facilities and Method of Heating and Ventilating Roundhouses was presented by Mr. D. R. MacBain, Chairman of the committee.

Mr. H. H. Vaughan (C. P. R.).—I have had considerable experience with the direct steam heating system. We have not only been able to warm the houses, but we have done it at a saving in the coal consumed for heating over that which was used in previous years, the saving in coal alone being sufficient to justify the cost of putting in the heating plant. The Elkhart roundhouse of the Lake Shore was designed so that the cold air entering under the doors would be warmed by the pipes in the pit, and as it ascended it would carry with it the steam and smoke. That idea has been amply carried

out in practice. I believe that the system of heating and ventilation suggested in the report is probably the best, provided there is a proper height of smoke jack and ventilator. We found that a short jack and short ventilator does not relieve the smoke trouble. We are now putting in ventilators 20 or 25 ft. high, in order to get a good vertical draft through them.

Mr. Wm. McIntosh (C. R. R. of N. J.).—We found it practically impossible to obtain any satisfactory results from heating with hot air from a horizontal direction. The hot air pipes were around the larger circumference of the house about 8 ft. above the floor. There were also chambers surrounding the pits through which hot air was forced, and which could be directed into the pit through portholes. Our foreman suggested that as he was obtaining no service from the large air pipes, I should permit him to close up some of them and see what he could do by taking air entirely through the ports in the pits. This was tried and proved so successful that we plugged up the large air pipes and directed the current through the pit openings entirely. I think in most cases it is practically impossible to obtain any satisfactory roundhouse heating through the air pipes carried at considerable distance above the floor.

Mr. J. F. Walsh (C. & O.).—By using a self-propelling 3,000-lb. crane at places where we do not have room or the need for installing a large coaling plant, we have reduced the cost of our coaling and loading expenses from 13 men to six men. It will quickly clean out a gondola car, with the exception of the corners, and 15 minutes work on the part of a man with a shovel will finish that. It will also take the ashes out of a level track or pit.

Mr. W. D. Robb (Grand Trunk).—All the turn-tables on our road have been operated by air motor for the last five or six years successfully. The turn-tables being outside, on account of the cold weather and the amount of snow, a set of pipes runs around the rail and in the center of the turn-table, and these pipes are heated with the same system that we have in the shop. This keeps the table free from trouble and works as well in cold weather as in warm weather.

The Technical Education of Railroad Employees.—The paper on this subject by Mr. George M. Basford was printed in the *Railroad Gazette* last week.

Mr. John Tonge (M. & St. L.).—To prepare apprentice boys it is necessary to have good foremen. There are foremen of different kinds, and if the foremen do not interest themselves to educate the apprentices, you are going to have very poor workmen. There is no question but the foremen can take the place of the parent; in fact, to much better advantage than the parent can himself. It will be by the constant and daily touch of the foreman with his apprentices that he can bring them to such a state of interest that they will think of their future.

Prof. W. F. M. Goss (Purdue University).—No one will deny the need of apprentices in our modern shops. I know that there are difficulties in maintaining apprentices in shops—in boiler shops, in forge shops, in machine shops—which in part grow out of the objections of the men. It seems to me that any such objections are founded upon a mistaken view of the situation, and they must be overcome. Certain it is that no workman can in principle object to a system which is to train his own son, and it seems to me that when the workmen of any shop come to understand that a system of apprenticeship which is well developed and well thought out by those in charge of the shop, is devised for the purpose of training his own children and his neighbor's children, one phase of the present problem will be made easy.

Then, of course, it is equally true that the apprenticeship must be made attractive to the young men, else the young men do not come. It was easy to secure apprentices when shops were small and those in charge of the shops were interested in the young men of the neighborhood. It is difficult today when shops have become large and there is lacking within their organization that personal interest in the young men which is essential to the success of the apprentice. Many of the manufacturing establishments are meeting that condition by a separate organization which shall have charge of and shall control the apprentices in their shops, and it is clear to my mind that the railroad organizations will need to do something of the same sort. Indeed, Mr. Basford's paper, as I understand it, contemplates such an organization. There must be some person, or some group of persons, of any large organization especially charged to care for and to lay out the work for the young men who are to be the future workmen of that establishment. When that is done, then it becomes easy to secure that element of personal attention to the apprentice, it becomes easy to insert elements of real education into their course, and when that has been accomplished, the advantage of going one step further and introducing some actual school work into the program of the apprentice, would not be difficult.

Mr. W. D. Robb (Grand Trunk) described briefly the apprentice system adopted by his road. This system was described in the *Railroad Gazette*, Oct. 2, 1903. The number of apprentices at present on the road is as follows: Montreal, 234 machinists, 90 apprentices, a percentage of 38; Toronto, 64 machinists, 25 apprentices, 39 per cent.; Stratford, 289 machinists, 110 apprentices, 38 per cent.; Fort Gratiot, 110 machinists, 60 apprentices, 54 per cent. The average is 40 per cent. of apprentices.

Mr. J. F. Deems (N. Y. C.).—There is no question to-day confronting the railroads of this country that is so important in all its bearings and ramifications as this question of the proper education of the employees of the railroads, and I know that some important roads are already taking action. Just what the outcome will be I am not quite certain. I hope, however, that it will be the establishment of some proper apprenticeship system, accompanied by educational facilities, and I am looking forward with a good deal of satisfaction to the outcome of these schemes that are now being considered. I feel sure that it will be attended with very good results.

Mr. W. E. Symons.—I think each member of the association should constitute himself a committee of one when he gets home to talk to his president or general manager in reference to the wages paid to firemen, master mechanics and other subordinates. One reason we do not have more apprentices is because the situation is not sufficiently inviting. We have numerous instances of foremen and master mechanics occupying positions at $50, $65 and $80 a month which ought to pay from $30 to $50 and possibly 100 per cent. more. A man will not endure years of hardship and frequently of privation to fit himself for a position that, when he secures it, the compensation is not equal to that of a machinist or locomotive engineer, or men engaged in the ordinary industrial walks of life.

Mr. S. W. Miller (Pa. Lines).—The paper demonstrates clearly that its author does not believe in special apprentices. He says that it is a serious mistake, and that for 20 years the railroads have made this mistake I do not agree with him, because I know of too many successful railroad officials who have been promoted from the special apprentice rank, through the special apprentice course. But I want to say that they were not made superintendents of motive power in three years. And I think that is where those who feel that the special apprentice system is the solution of the trouble we are experiencing in getting competent men to fill the higher positions, make their mistake.

I do not believe that ten years on an average is any too long for a young man to serve a special apprentice course. I think his course in the shop should be just as long as that of an ordinary apprentice. I do know of cases which have come under my personal observation, young men who have been sent to the shops over which I had jurisdiction, who made flat failures of themselves, and the reason was that they felt that their education which they had received at college made them, not better *educated* boys, but better boys; between the two statements there being a serious difference.

Another important point. I do not believe that we realize how the men feel about things. I do not believe that it is generally appreciated that just as soon as a man is selected from the ranks and made a foreman there is an invisible barrier between him and the men who were formerly his shop mates. It is almost the same as if a brick wall had been built up between them. He does not associate with the men any more and frequently feels that he is somewhat better than they, and his wife will not call upon their wives, and his children will not walk to school with their children. As that goes up the line, and it gets to the general foreman or master mechanic, the wall becomes higher and it becomes thicker, and it becomes more difficult to discover just exactly how the men feel about things. I believe it is the most important duty of a master mechanic in charge of a shop to be fully in touch with his men and to know, not from hearsay or through the foreman, or any other outside source of information, but to learn from the men themselves personally how they feel about matters which are going on in the shop.

The report on Water Softening for Locomotive Use was read by the Secretary in the absence of all members of the committee.

Mr. A. E. Manchester (C., M. & St. P.).—The report does not approve of the introduction of chemicals into the boiler direct. Any railroads that have to deal with lime salts of any description, or alkalis, would do well to treat the water in the boilers if they have no water softening plants in operation.

Mr. E. W. Pratt (C. & N. W.).—It is better to treat water in boilers than not to treat it at all. We have practically doubled the life of flues and fireboxes in some of our poor water districts by adding blow-off cocks, using soda ash, and increasing the facilities and pressure for washing out boilers.

Mr. Walsh (C. & O.) also related experiences to show that it was advantageous to treat the water in the boiler rather than to use untreated water. Mr. Deems (N. Y. C.) reported that a plant for purifying water by electricity would shortly be installed on the Big Four. It will have a capacity of 250,000 gals. a day.

The report on Time Service of Locomotives was read by the Chairman, Mr. Wm. Forsyth.

Mr. F. H. Clark (C., B. & Q.).—We have recently gotten out some blanks on which the superintendents get daily statements of the time consumed in turning engines at terminals. The statement requires the co-

operation of the yardmaster and shows the time of arrival of the engine at the yard, time of arrival at the roundhouse, the time when ready for service, the time ordered, the time out and some other information which enables us to determine very accurately whether we are getting a satisfactory movement. It does not always enable us to keep the engines busy, because that depends on traffic, but it has enabled us in some cases to expedite the movement of engines in the house.

Mr. F. F. Gaines (P. & R.).—Where engines have been pooled, some system of keeping a record of the movement of an engine, not only from the time it starts out from a given point, but a record which shall include a complete cycle of its movements, I have found beneficial. Such a record enabled us to explain always, and quickly, why we could not furnish power, if we could not, and also called the attention of the transportation department frequently to the fact that they were holding out engines on the road and delaying them, and by getting together on the thing it resulted in materially increasing the engines available.

Shop Layouts.—The report was presented by Mr. C. A. Seley, Chairman of the committee.

Mr. F. F. Gaines (P. & R.).—The report seems to question very strongly the advisability of large shops or the use of a single shop for a railroad system. The large shop is no innovation whatever. The Pennsylvania Railroad shop at Altoona, which has been in existence for a great number of years, is a fair example of large shops. The present output of our Reading shops, where all the heavy repair work for the road is done, has been brought up in the past year to an average of three engines per day, and will be a little over 800 engines for the year, an increase of 22 per cent. over the previous year. This has been done with a notoriously old tool equipment, and only a sufficient number of tools to operate 48 out of 68 pits. On the basis of 48 pits we are getting about an engine and a half per pit per month.

Referring to the articles from the *American Engineer*, which are published as an appendix to the committee's report, there is considerable exception to be taken to them. Tables of outputs are valueless unless considerably more is known about the conditions under which the output is made. The character of traffic, grade, ballast, curvature, water supply, weight of engine, etc., vary for each locality. For instance, on a recent trip of inspection by some prominent officials, a certain shop located in a territory with a good water supply was very highly commended for its output on the unit basis. The average cost of engines repaired was only from $300 to $350 per engine, or about one-fourth the cost per engine at our Reading shops. During the past year the average cost of engines receiving general repairs was slightly under $1,500. This may seem high, but the power had become run down considerably, and the majority of engines required heavy boiler work, so that while apparently high it is really a reasonably low figure, it being about the same as that for the Central Railroad of New Jersey, as the average cost per engine varies only a few dollars from the average cost per engine on the latter road. This shows the fallacy of comparing output of shops in different localities on the unit basis.

The proper proportion of floor area for each department, based on the number of stalls, is also worthless when simply tabulated without reference to conditions. A majority of the shop layouts are deficient in floor area for machine tools and boiler work. The newer heavier power requires much more machinery to obtain the same output as was previously accomplished when engines were small. Higher steam pressures have very noticeably decreased the life of flues and fireboxes, and many recently built shops are preparing to overcome this defect by extensions.

Locomotive Front-Ends.—The report was presented by Mr. H. H. Vaughan, Chairman, who said in part: It has been found that one of the most important things in the drafting of engines is the loss of draft in the gases passing by the diaphragm. The variation between different engines in that respect is so serious as to overcome any increasing efficiency in the stack arrangement of one engine over another. However, experiments on diaphragms cannot be properly carried out in a testing plant. The whole diaphragm question to-day I think comes to the construction of a self-cleaning front-end without too much obstruction to the draft. We have assumed in our committee meetings that a self-cleaning front-end is a necessity in modern locomotive practice. If it is not, then we can probably make some experiments on the plant, but assuming that it is, we do not think that we could carry out experiments on the plant with reference to obtaining a self-cleaning front-end as satisfactorily as on the road. From our knowledge of the results at St. Louis, the most important question in connection with draft confronting the locomotive designers to-day is the obtaining of a self-cleaning front-end that offers less resistance to the passage of the gases than the one in common use. In some cases half the total draft created was required to get the gases from one side of the diaphragm to the other.

Topical Discussions.

Lawford H. Fry (Baldwin Loco. Works) opened the topical discussion on "The best known dimensions for water spaces around firebox to produce minimum consumption of fuel and replacement of firebox sheets, and reasons for same." His paper appears elsewhere in this issue.

Mr. G. R. Henderson.—I understood Mr. Fry to say that the firebox which is narrow as you rise up from the mud ring interferes with the escape of steam from the water more than if it slopes inwardly.

Mr. Fry.—If the side sheets slope inward the rise of steam coming perpendicularly will have to pass through the descending water on the outside sheets and will interfere with the current going down the outside sheets. If the firebox slopes outward the steam will go along the firebox sheets and the water go down clear of the steam.

Mr. T. H. Curtis (L. & N.).—I kept careful data for three years to see if we could determine whether there was a given mileage for staybolts. I have found in a certain class of boilers that there was practically a given mileage for the breaking of staybolts; although if you take a boiler in some other class of engines that is almost the same, that rule would not apply at all. For instance, some boilers would break a large number of staybolts in the front flue sheet. Other boilers, of a similar class, would not break them in the flue sheet but broke them in the side sheets. I did find that over one-half of all the staybolts broken were broken in the first four rows adjacent to the cross sheets, or the sheet across the boiler, where the firebox may not expand. I also found that the increase of steam pressure caused an increase in the breakage of staybolts, but I could not find that the length of the staybolt made much, if any, difference in the breakage. Some boilers had staybolts as long as 14 in. I watched these very closely and they broke more than any others. One broke in two places, breaking a piece out in the center. I never saw but one other example of that kind. It is my conclusion that there is some unknown law which applies to these boilers. If we knew it, we could use it to good advantage. I believe the pressure is a large factor in making up this law of broken staybolts.

Mr. F. M. Whyte (N. Y. C.).—Experience has been had with sloping throat sheets that where the slope has been too great the sheets have been taken off after they had been a short time in use, showing the water did not get to the sheets to protect them.

Mr. Deems (N. Y. C.).—Some years ago I had an experience with some of the first semi-wide firebox engines which were built, in which we gave both the inner and the outer shell a very decided slope and the result was that the side sheets burned out within five or six months.

Mr. A. E. Mitchell (L. V.).—The old-fashioned deep boxes, where the firebox was between the frames was always more satisfactory. We always got better results by making the inner sheet and the outer sheet widen rapidly as they rose to the top, the water space being 2 in. wider at the top of the vertical portion than at the bottom. I have always endeavored in designing engines to make the firebox sheet as near perpendicular as possible.

Mr. C. A. Seley (C., R. I. & P.).—The power committee on the Rock Island last year determined to adopt 4½ in. as the standard of width of the mud rings. The question of 5 in. was also considered, but it introduces certain difficulties in the forging of the ring and in the riveting, to some extent. I believe that 4½ in., which is an ample increase on the present practice, would largely minimize the breakage of staybolts.

High-Speed Steel.

Mr. J. A. Carney (C., B. & Q.).—The almost prohibitive cost of high-speed steel makes one consider carefully whether or not it should be purchased for all classes of work, and especially for old machines which cannot tax the capacity of the cheaper self hardening steels. When one figures that a tire lathe tool costs from $8 to $10, it looks like a lot of money. On the other hand, if we will take into consideration the slower speed, smaller output, time lost sharpening and dressing tools and the loss of material incident to dressing and sharpening, it will be seen that the cheaper tempering and self-hardening steels are too expensive to be considered. A case in question: A set of bolt cutter dies made of 10-cent tempering steel cost 21 cents for labor and 5 cents for material, total 26 cents, and cut 100 bolts before dressing. A set of similar cutters made of 75-cent high-speed steel cost 37½ cents for material and 40 cents for labor, total cost 77½ cents, and cut 1,100 bolts before dressing. Enough tempering steel cutters to do the same work would have cost $2.86. This is what I mean when it is said we cannot afford to use low capacity steel.

The use of tool holders and smaller sizes of steel will effect great economies in the investment of high-speed steel, and in one instance the introduction of tool holders reduced the number of pounds of steel required for a wheel lathe over 80 per cent., and instead of a tool 1 in. x 2 in., 18 in. long, costing $7.87, a 1-in. x 1-in. x 8-in. tool, costing $1.87, is used, and the tool holder does not wear out or break and costs 5 cents per pound, against 75 cents per pound for high-speed steel.

Rosebit reamers can be tipped with high-speed steel and increase their efficiency from 750 to 1,000 per cent.; in fact, a little ingenuity and thought will open up economies in the quantity of high-speed steel that were

never given a thought when 10-cent steel was used.

Larger section tools of high-speed steel which have become too short can be hammered out into tools of smaller section with excellent results.

High-speed steel has come to stay until some more efficient material is discovered, and while its price may make us question its economy, a second thought will convince us that we cannot afford to go back to the cheaper tool steels for heavy work, however good these may be in their class.

Mechanical Stokers.

Mr. Wm. Garstang (Big Four).—It has been four years since the first mechanical stoker was tested on a Big Four engine. About six months ago we installed mechanical stokers on seven of the largest passenger engines on our system. Four of these engines have wide fireboxes and three have the long, narrow firebox. Both styles of firebox have been fired satisfactorily by the mechanical stoker. From advices we receive from the division officers, we can safely say there is a noticeable saving in the amount of coal consumed per car and engine mile when operated with the stoker in comparison with hand firing, but at this time we are not prepared to state the exact per cent. of such saving. The same advices indicate a reduction of boiler work, on flues, staybolts and firebox seams, which, in our opinion, is due to the fact that we are enabled to carry a lighter, cleaner and more uniform fire, as well as uniform boiler pressure.

During the six months in which these stokers have been in service the cost of their maintenance has been very light. The principal cost of maintenance is laregly due to improper lubrication. What few failures we have had with the stoker are due to the same cause. It is my opinion the mechanical stoker for locomotives has come to stay, (1) because it is practical and efficient; (2) we believe by the adoption of the mechanical stoker the railway companies will be enabled to use a cheaper grade of coal than can be used in hand firing, resulting in a great reduction in their fuel bills; (3) it will relieve the fireman of some of his most arduous labor and give him greater opportunity to observe signals while on duty, and he will arrive at the end of his run in condition to improve his chances by study for promotion to the position of engineer.

Mr. W. E. Symons.—I think this is a subject which should be taken up in regular committee work. Undoubtedly the association will be called upon from time to time to note the progress made. The roads buying large power I think are contemplating the use of a mechanical device for firing their engines, and it seems as reasonable to suppose that it will displace the firemen on these large engines as that the injectors of to-day displaced the pumps used years ago.

Mr. W. S. Morris.—I would like to see a standing committee on that subject, because I think it is a progressive measure and one upon which we are all anxious to get the fullest information.

Mr. Angus Sinclair (Loco. Eng.).—My impression of the locomotive stoker is that it is certainly as efficient now as the injector was when we got to first using it, just as efficient as the balance valve was when we got it first, and as was the case with many other things that might be mentioned if one should think of them all. It is getting to be nowadays that the capacity of the locomotive is the capacity of the fireman to maintain steam. When that capacity has been reached, it is only the part of engineering to get something better, something that you put power on instead of human muscle.

Mr. Geo. L. Fowler.—On a special trip I made with a mechanical stoker the fire was perfectly thin and smooth over the whole surface whenever I had a chance to look into the firebox, and when we reached the end of the line, 111 miles, there was about 7 in. of fire on the grates and it was smooth and burning evenly through its whole surface. The engine was taken to the roundhouse and sent back over the same line without being refired.

Mr. H. F. Ball (L. S. & M. S.).—The most difficult part of the problem has been to distribute the coal over the grate, and now that several of the designers of automatic stokers have overcome that difficulty it is an easy proposition to eliminate the shoveling into the hopper. We ought to encourage them not to stop at spreading the coal over the grate, but insist on the designers providing an appliance to take the coal from the tender to the hopper.

Mr. J. F. Walsh (C. & O.).—We have operated a stoker with a 60-car train for 60 miles without the fireman handling a shovelful of coal, by raising the floor of the tender so as to give the coal a slight pitch into the hopper itself. In another instance we attach a scoop in such way as to permit it to run back into the coal pile and give it an eccentric motion by attaching it to one of the tender truck axles and work the coal forward into the magazine.

A motion to appoint a standing committee on mechanical locomotive stokers was adopted.

Relief and By-Pass Valves for Locomotives.

Mr. A. E. Manchester (C., M. & St. P.).—We have practically two types of valve in use. One is an excess-pressure valve, or sometimes termed a water valve, located in the cylinder heads or steam chests, and is intended to guard against an excess of steam pressure in the cylinders, steam chest, steam pipes and dry pipes, due to accumulations of water, or to excess pressure in the cylinders by the possible slipping of an eccentric, or to the reversing of the engine with the throttle closed.

The other valve is the vacuum or drifting valve. There is quite a variety as to details of construction, but the work to be performed by them all is about the same. The use of this particular valve has been criticized to some extent. A majority of them draw in air, which destroys the vacuum in the cylinder from the outside, and there has been some difficulty in keeping some types in repair. The objection raised against the valve is that it lets cold air into the cylinders, cools off the walls and destroys the lubrication. I believe a vacuum valve is a good feature on an engine. In fact, there are some types of engines which it would be difficult to operate without them. Without the vacuum valve, an engine in drifting must get the front-end or other gases into the cylinder, or in the case of one or two types of valve, must shift the pressure from one end of the cylinder to the other. Several of these devices have proven to be quite delicate and hard to maintain.

A properly constructed relief valve or vacuum valve is desirable. If the valve is of proper size to do the work, the piston rods and valve stems will run clean. If the valve is out of order and plugged, you will find the pistons and valve stems running black, showing that there are gases being drawn into the cylinder.

Mr. C. A. Seley (C., R. I. & P.).—My attention was recently called to the practice of a large western road which was taking off the vacuum relief valve, which action was based on the recommendation of a paper read at the St. Louis Railway Club, I think in February, 1904. It was stated in that paper that there was no drawing back of the gases from the front-end, and the front-end was open to observation. Experimenters put articles through the exhaust nozzle when the engine was running at various positions of the lever, and were unable to draw in anything—it always came out.

Mr. H. H. Vaughan (Can. Pac.).—We have cylinder-head relief valves, steam-chest relief valves, by-pass valves, and drifting valves, and the thing is getting pretty well mixed up. My opinion is that we can get along as well with a larger cylinder cock as we can with a cylinder-head relief valve. If we use a good-sized cylinder cock, 1 or 1¼ in., and a vacuum valve on the steam chest, we have about all we need to keep going.

Mr. T. H. Curtis (L. & N.).—I think the high-pressure relief valve is largely a matter of ornament. If you look at the engines equipped with them, you will generally find that the relief valve is full of grease and has not been used since the engine came out of the shop. A relief valve on the cylinder heads is never large enough to do any service. The Louisville & Nashville had equipped nearly every engine with these high-pressure relief valves. They were never used. We had a large number of cylinder heads broken. We changed the cylinder cocks from ⅜-in. to ¾-in. and have had comparatively no more cylinder heads broken.

I think the vacuum valve is a necessity, but should be one which will fall open of its own accord, and its greatest use will be in drifting down hills; also while the engine is in the roundhouse it will be open and allow the leakage of the throttle to escape, and not cause the engine to run into the pit or through the wall.

On motion, the subject was referred to a special committee for report.

Are Locomotives With Self-Cleaning Front-Ends Satisfactory?

Mr. E. W. Pratt (C. & N. W.).—Out of 1,307 locomotives on the Chicago & North-Western over 600 have the self-cleaning front-ends. We also have equipped a number of engines as small as 17 and 18-in. cylinders, with the new style front-end, and it is giving satisfaction. By comparing the amount of coal per 1,000 ton miles for two successive years—before and after the changes in front-ends were made—we find the figures practically the same. As a matter of fact, it shows a 3 per cent. saving, which I would only quote to indicate that we feel justified in saying that our fuel consumption is not increased on account of the self-cleaning feature. Some decided advantages are gained. Delays on the road due to dumping cinders from the old style front-end, are of course entirely eliminated; also the setting fire to the packing in the engine trucks from hot cinders in dumping the front-ends. There being no cinders to burn, we do not have the rims and the doors in front-ends destroyed as formerly. This was particularly of great disadvantage with the pressed steel forms, which warped more readily than the cast-iron. In changing the style of front-ends we have not shortened up the extended front, which I believe would be of advantage in the way of obtaining better draft with still larger exhaust nozzles.

The Hungarian State Railroads administration is in trouble because of a lack of taste in ladies' dress. It employs many women as cashiers at stations, and has prescribed for them a uniform jacket which these ladies find unbecoming. Many have taken off the jacket while on duty, and others have altered the cut and trimming to suit their own taste. Recently the management has issued iron-clad orders that the jacket must be worn cut and trimmed as the regulations prescribe.

Master Car Builders' Association Committee Reports.

The committee reports of the Master Car Builders' Association for this year are not as long as usual. They cover a fairly wide range of subjects but only one or two are important for record. An abstract of each will be found in the following pages.

DRAFT GEAR.

The committee recommends that the 1-in. total drawbar side clearance shown on M. C. B. Sheet "B" be increased to 2½ in. total clearance, and also recommends that experiments be made to determine how much more clearance can be safely used without the use of a centering device.

In view of the fact that the work of the draft gear committee is now so closely allied with that of the coupler committee, it does not seem that there is any need to continue the draft gear committee under present conditions. If it is not the desire of the Association that the committee should take up the question of testing new designs, as was done several years ago, or improvement in old designs, it would probably be well to discharge this committee or merge it with the coupler committee.

The report is signed by Le Grand Parish, Chairman; E. D. Bronner, W. F. Kiesel, Jr., G. W. Smith, Mord Roberts.

STENCILING CARS.

The committee has confined itself to the following recommendations:

First.—The style of letters and figures to be used so that uniform stencils may be prepared and used on all freight cars.

Second.—A uniform height of letters and figures for certain specified markings, so that in a general way these markings shall be uniform on all freight-car equipment.

It will be noted that the committee does not recommend the location on the car for the various markings, believing that each road desires more or less discretion in this respect, and also for the reason that this would be a very difficult matter at this time, on account of the various new types of steel-car equipment being introduced, which will not permit the same location for similar markings as on the old wooden equipment they are superseding.

It will further be noted that the committee does not confine its recommendations for the height of letters to any one specified height, as a general thing, and in endeavoring to recommend certain limits for height for different markings, hopes that a general agreement within these limits may be arrived at. In recommending six sizes only for the heights of letters and figures, the committee believes that it has fairly covered the ground and given a choice which may be accepted by every one. Designs have been submitted for the type of Roman letter, which, it is trusted, will meet with general approval. The designs submitted are for the 7-in. letters and figures only. If these designs are accepted with the report by the convention, it is the purpose of the committee to prepare designs for the various other sizes of letters and figures recommended in the report and submit them for adoption as recommended practice by letter ballot. The committee has not prepared designs for the smaller letters and figures, for the reason that this entails considerable labor and some expense, and if the Association passes favorably upon the submitted designs, the committee will make photographic reductions of the submitted letters and so modify them that the proportion will be harmonious, as it must be remembered that as these letters are to be stenciled, the apertures in the stencils must not be less than can be properly brushed through, and for small letters the widths of certain kinds are not strictly in proportion to the widths shown in the larger ones. The committee makes the following definite recommendations:

First.—It is recommended that Roman letters and figures be adopted for uniform stenciling of freight cars.

Second.—It is recommended that the sizes of these letters and figures shall be confined to the following heights: 1, 2, 3, 4, 7 and 9 in.

Third.—It is recommended that 7-in. or 9-in. letters or figures be adopted for the initials or name and numbers for the sides of cars, and 4-in. letters or figures for the same markings on the doors and ends.

Fourth.—It is recommended that for other car-body markings on sides and ends, such as capacity, couplers, brake-beams, class of car, date built, outside dimensions, inside dimensions and markings inside of car, 2-in. or 3-in. letters and figures be used, with the following exceptions:

(a) All weight marks should be 3-in. or 4-in. letters or figures.

(b) Trust marks, patent marks, and other private marks, should be 1-in. letters and figures.

Fifth.—It is recommended that all marks on trucks should be confined to 1-in. and 2-in. letters or figures.

Sixth.—It is recommended that stenciling on air-brake cylinders or reservoirs should be 1-in. letters or figures.

It will be noted that the above recommendations of the committee conflict to a certain extent with the recommendations for stenciling certain markings on cars, adopted in 1896 and shown on page 451 of the 1904 Proceedings, in that certain letters containing fractional sizes are there recommended; and as it is a distinct recommendation of this committee that all fractional sizes shall be omitted, the committee would recommend that the old recommendations referred to be changed to conform to the committee's report. Furthermore, the design of stencil is shown in the report referred to for the A and B end of freight-equipment cars, these letters being 1½ in. in height and the circle 2¾ in. in diameter. The committee recommends that the relative proportion for these stencils be adhered to, but that the height of letter be increased to 2 in., diameter of the circle being in proportion to the increase in size of letter.

In making its investigations, the committee has found that very little uniformity exists in regard to the size and design of letters and figures of different sizes on any railroad, one shop a very short distance from another one on the same road often using stencils for the same letters and figures which materially differ from those used at the other point. It therefore seems extremely desirable at this time that some definite agreement be reached by this Association, particularly in view of the proposed renumbering of freight-car equipment on all railroads, and it is with the object of having some uniformity arrived at this year that the committee submits this report.

The report is signed by H. M. Carson, Chairman; J. S. Lentz, Jos. Buker, G. T. Anderson, W. F. Bentley.

STEAM LINE CONNECTIONS.

Meetings of this committee were held with representatives of car heating companies during the year 1904 with the view of arriving at a uniform design which would represent the best practice. Efforts were also made to harmonize the differences in design of the various couplers with a view of being able to present a standard to the Association which could be adopted by the roads without entailing any hardship.

During the past few years considerable improvement has been made in coupler designs, and railroads have gone to a considerable expense in experimenting and in the adoption of new designs of couplers. The differences in dimensions of couplers in service on the different roads is so at variance that it does not seem possible to present even a compromise design that could be used during the transition period. To present a design to the Association which would not interchange with the present designs was felt by the committee to be inadvisable and useless, as it would only result in an Association standard which could not be followed. However, the committee calls attention to the progress being made in combination automatic couplings with which a number of roads have been experimenting for some time past with apparently satisfactory results. In view of the development of this form of coupling, and the advantages which it possesses over the prevailing single couplings, and the further fact that the combination coupling is being considered for adoption by some roads, the committee suggests that the endeavor to harmonize and present a standard based on the present form of coupler be abandoned, and a new committee appointed to consider and report to the Association on a standard form of combination automatic coupling.

The report is signed by H. F. Ball, Chairman, T. W. Demarest, F. H. Clark.

TRIPLE VALVE TESTS.

This committee received only one application for making tests of triple valves, which application was received too late to arrange for tests to be made before the time of the convention. They will probably be made in September. The committee has no recommendations or further report to make. Its report is signed by Wm. McIntosh, Chairman; F. H. Scheffer, W. S. Morris, C. A. Schroyer, A. J. Cota.

ARBITRATION.

During the year 15 cases were presented to the committee for decision. A large number of changes in the Rules of Interchange have been suggested to the committee for recommendation to the Association, a majority of which do not meet with its approval. The report includes each of the suggested modifications with the committee's opinion appended. The most important changes which have been approved by the committee are the Western Railway Club's proposed new definition of worn flanges; New England Railroad Club's proposed rule covering the application of axles under old cars in accordance with their marked capacity; addition to rule 54, excluding American continuous draft key from combination of defects denoting unfair usage; changes in Rule 56 covering application of malleable iron for gray iron parts and vice versa in making repairs; insertion of a rule making the use of air-brake hose of M. C. B. specification quality obligatory after July 1, 1906; changes in the scale of prices for couplers and coupler parts; changes in prices for replacing brake-beams, center plates, journal boxes and other parts; changes in prices for cleaning air-brakes; changes in prices for destroyed steel cars.

The latter part of the report is taken up with correspondence from members of the Association in regard to the insertion of a rule making owners liable for cars destroyed by acts of Providence. The committee presents the matter to the Association

with the recommendation that the rules be not changed.

BRAKE SHOE TESTS.

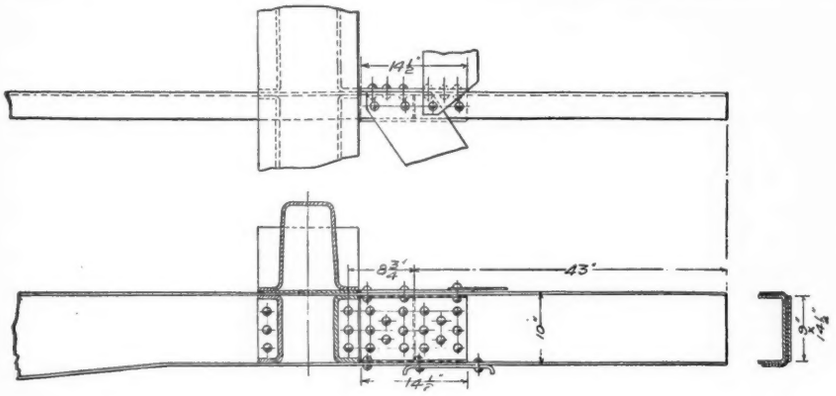
During the past year four brake shoes were submitted to the committee for test and were tested under the M. C. B. specifications on the machine located at Purdue University. The first shoe was a plain cast-iron shoe of medium hardness without inserts. The second shoe was a cast-iron shoe with a steel back and when received had a transverse crack extending through the body to the steel plate in the back. The third shoe was a shoe made by the Pittsburg Brake Shoe Company for use on cast-iron wheels only. It is made of a pressed steel shell having corrugated ends and sides and filled with a mixture of unknown composition. The fourth shoe was one made by the same company and intended for use on steel-tired wheels. It is made of a malleable iron shell filled with an unknown mixture.

All of the shoes passed satisfactory tests, the results of which are given in detail in the report. They had uniformly high frictional qualities and no bad effects on the wheel. The committee calls attention to the fact that in improving their output manufacturers make frequent use of the Association's machine. Work of this nature does not formally come to the attention of the committee. It is reported, also, that one maker is installing for private use a testing machine designed after that of the Association.

The report is signed by Charles Coller, William Garstang, W. F. M. Goss.

REPAIRS OF STEEL CARS.

The committee recommends that the splicing of sills on steel cars and cars constructed with steel underframes be permissible. The splice for center sills, except as otherwise stated, to be located not less than 8 in. from either side of the body bolster, consisting of butt joints. The butt joints to be reinforced by plates on both sides to be not less than twice the length of the protruding end, but not exceeding 24 in., and not less than same thickness of web plate, with the one on the flange side of channel to include flanges, while the outside plate should only cover the web. The rivets to be spaced as shown on sketches "A" and "B."



SKETCH A.

Sketch "A" shows the method of splicing center sills in front of body bolster, and Sketch "B" shows method of splicing center sills back of body bolster.

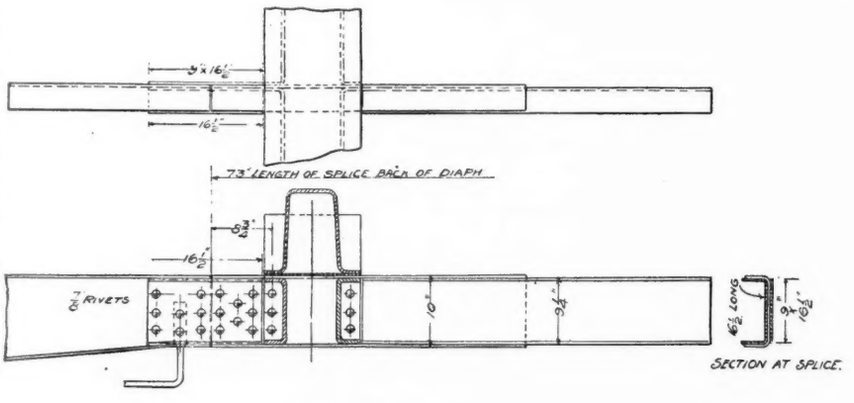
Sketch "C" shows method of splicing in cases where cars are damaged to such extent that the center sills have to be cut off less than 8 in. from the front side of body bolster; this method is not recommended for sills with protruding end less than 3 in. The outside plate in this splice may be made of pressed steel or a casting. The rivets to be spaced as shown on sketch.

Sketch "D" shows the method of splicing side sills; this splice may be located on either side of the body bolster. The rivets to be spaced as shown on sketch.

The report is signed by T. H. Russum, Chairman; R. F. McKenna, I. N. Kalbaugh, G. N. Dow, E. B. Gilbert.

DOORS.

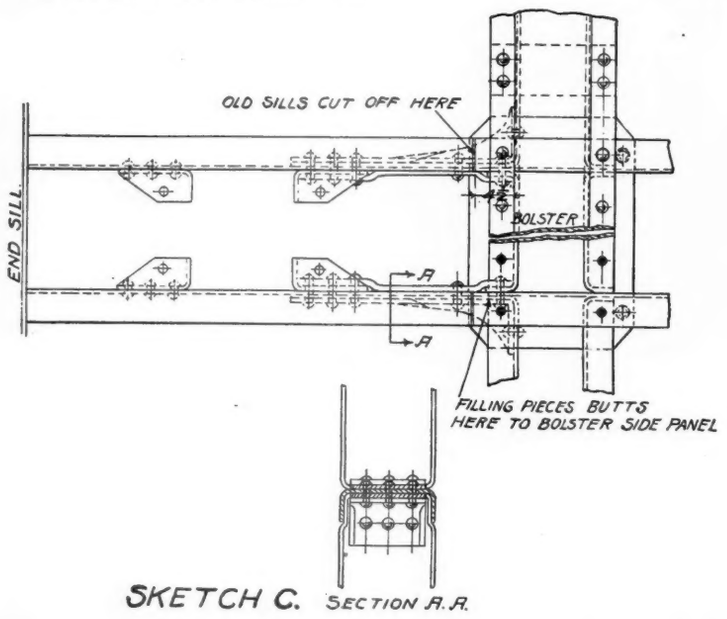
This committee was appointed last year to (a) revise the drawings of the outside sliding door shown on M. C. B. Sheet "F" and to recommend a design for a flush car door; (b) to consider the question of a design of a suitable grain door for large capacity cars. A circular of inquiry was sent out containing 23 questions but replies were received from only six roads.



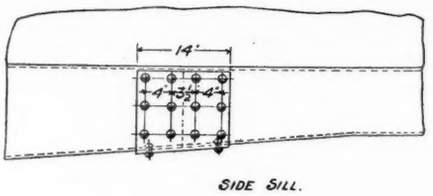
SKETCH B.

The committee feels that the members are not particularly interested in the subject assigned, as shown by the very limited number of replies received and the meager information brought out in answer to the circular of inquiry issued, and has no recommendations to make as to the revision of the drawings of outside door as shown in M. C. B. Sheet "F," or for suitable grain doors to meet the requirements of large capacity cars.

The report is signed by J. E. Keegan, Chairman; W. E. Sharp, Thos. Treleaven, J. W. Muncy and D. Van Alstyne.



SKETCH C. SECTION A.A.



SKETCH D.

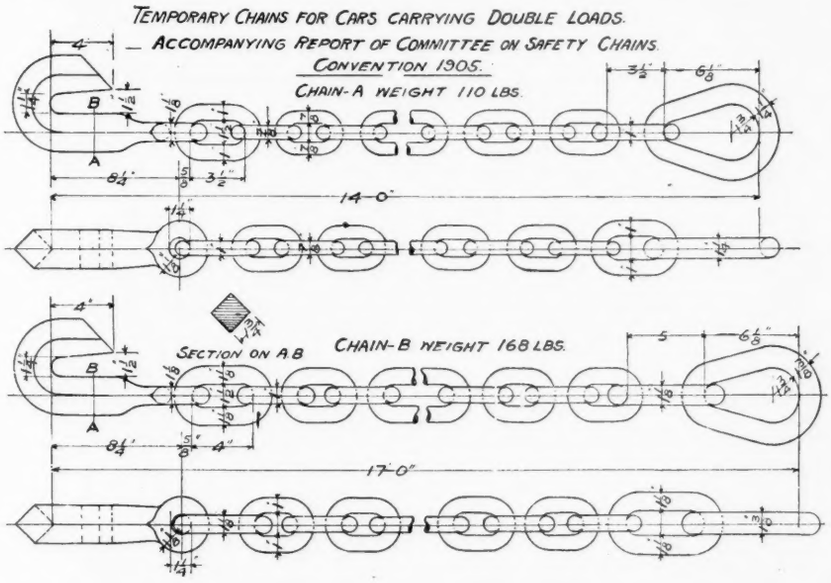
SAFETY CHAINS.

The committee recommends that the permanent safety chains shown on Sheet "A" of Recommended Practice remain as such until something better can be devised.

The committee believes that something better than this permanent safety chain can be designed in the way of fixtures for application to freight cars for auxiliary couplings, and recommends that a new committee be appointed to work this out, or the present committee continued for this same purpose.

The committee presents drawings of two temporary chains, which it believes will be found generally satisfactory for chaining together cars carrying double loads, and recommends their adoption as recommended practice to be included on Sheet "A."

It recommends that Rule 75 in the M. C. B. Rules of Interchange be modified, so that chains "A" and "B" as shown in Recommended Practice on Sheet "A" must be used,



and unless the receiving road delivers an equal number of like chains in exchange therefor, it must issue in lieu thereof a defect card to cover, such chains being billed for at 110 lbs. for "A" and 168 lbs. for "B" chains.

The committee further recommends that the rule in the code of recommended Rules for Loading Long Materials which refers to chaining of cars together be modified to correspond to the above recommendations.

The report is signed by R. P. C. Sanderson, Chairman; R. L. Kleine, R. B. Rasbridge, Jas. Macbeth, J. F. Walsh.

REVISION OF PASSENGER CAR RULES.

The committee submits a code of rules governing the repairs of passenger equipment cars which it would recommend be substituted for the present rules.

Code of Rules Governing the Condition of and Repairs to Passenger Equipment Cars in Interchange.

1. Each railroad company shall give to foreign cars, while on its line, *the same care and attention that it gives its own cars*, except in case of cars on which work is done under special agreement existing between the company owning the cars and the road operating the same.

2. The expenses of maintenance of passenger equipment operated in interchange or line service shall be divided into three classes, namely:

(a) Owner's defects.

(b) Delivering company's defects.

(c) Line expenses proratable, against the roads composing the line, on a mileage basis.

3. (a) *Owners' defects* are such defects as are chargeable to the owner of car under the provisions of the Master Car Builders' Association freight rules, and which are not included in proratable items shown in this code as chargeable as line expenses.

(b) *Delivering company's defects* are those which are positively shown by existing records to have been occasioned by negligence or unfair usage.

(c) *Line expenses* shall consist of the expense of cleaning, lubrication (oil, waste, tallow and labor), lighting (oil, wicks, chimneys, burners, shades, gas, gas globes, bowls and tips), supplies and repairs (ice, coal, candles, glass broken).

4. As in freight car interchange, the road making the repairs for defects not proratable against the line is privileged to bill the car owner for those repairs unless there was evidence to indicate that the damages were occasioned by unfair handling on the part of the delivering company.

5. Information as to mileage made by cars must be promptly furnished on request by roads over which cars are run.

6. (a) Cars must be thoroughly oiled at terminals with one-half gallon of oil, one-half pound of waste and the expenditure of one-half hour of labor.

(b) No charges to be made for lubrication at intermediate points.

7. Only one journal bearing per journal may be charged per trip.

8. No labor charge shall be made for applying brake shoes, journal bearing or hose (air, steam or signal), or for icing, filling lamps, filling gas tanks, or coaling cars.

9. No credit to be allowed for scrap brake-shoes removed.

10. Loss of metal from tires of steel-tired wheels, caused by flat sliding is chargeable to the company on whose road the damage is inflicted.

11. Axles broken in fair usage or having journals cut or less than 3½ in. in diameter may be renewed at the expense of the car owner.

12. During the car-heating season, a charge of 15 cents per day per car shall be prorated against the line on a mileage basis.

13. (a) Brakes must be in perfect working order. *Cylinders must have been cleaned and oiled within six months* and the date of the last cleaning and oiling marked on brake-cylinder and triple valve with white paint.

(b) The adjustment of piston travel based on 70 lbs. as the initial pressure, must not be less than 5 in. nor more than 8 in.

Defects in Wheels.

14. (a) Loose wheels.

(b) Variation from gage beyond the limits as prescribed in the Rules of Interchange for freight cars.

Wheels, Cast-Iron.

15. (a) Shelled out, with treads defective on account of circular pieces shelling out, leaving round, flat spots, deepest at the edges, with raised centers, if 1¼ in. or more in diameter.

(b) Tread worn hollow; if tread is worn sufficiently hollow to render flange or rim liable to breakage.

(c) Worn flange; flanges having flat, vertical surfaces, extending more than ¾ in. from tread.

(d) Burst; if wheels are cracked from the wheel fit outward by pressure from the axle.

(e) Flanges, rim, tread, plate or brackets, either cracked, chipped or broken in any manner.

Wheels, Steel-Tired.

16. (a) Loose, broken or cracked hubs, plates, bolts, retaining ring or tire.

(b) Worn flange or tire; with flanges less than ¾ in. thick, or having flat, vertical surfaces extending more than ¾ in. from tread.

17. Flat spots; if flat spots, caused by sliding, exceed 1¼ in. in length.

Gas.

18. If a car is transferred from the service of one railroad to that of another, the receiving road shall issue an M. C. B. defect card authorizing the delivering road to bill against it for the quantity of gas in the holders at the time car was received.

Cars in interchange requiring holders to be filled, the receiving road shall be charged for the quantity of gas supplied.

For cars stored in shop for repairs, the company having the car in its possession shall be responsible to the delivering company for the gas in the holders. This will apply to sleeping car companies when cars are in their possession and out of service.

19. This code of rules is understood to apply to all equipment interchanged in passenger trains.

20. Bills for line charges must be made and rendered monthly, and prices for materials and labor shall be in accordance with the accompanying schedule.

Note.—The above rules shall take effect Sept. 1, 1905.

List of Prices Agreed Upon for Expenses of Maintenance of Passenger Equipment in Interchange.

	New.	Secondhand.	Scrap.
1. Axles, 4¼x8 inches	$14.00	$7.75	$5.25
Axles, 3¾x7 inches	12.00	6.50	4.50
2. Burners, round wick, each			.50
3. Burners, dual wicks, each			.30
4. Bell or signal cord and couplings, pr car			.75
5. Bearings, journal, per lb.			.16
6. Bearings, journal, credit for scrap, one-half weight new bearing, per lb.			.11
7. Bolts, nuts and forgings, per lb.			.03
8. Bolts, nuts and forgings, credit, per lb			.00¾
9. Bowls, opal glass, 9 inches, each			.50
10. Chimneys, round wick, each			.11
11. Chimneys, dual wick, each			.06
12. Candles, per lb.			.15
13. Coal (including labor), per ton			6.00
14. Chain, per lb.			.05
15. Chain, credit, per lb.			.01
Cleaning, per car:			
16. Parlor and sleeping cars, exclusive of bedding			1.55
17. Vestibuled passenger cars			.85
18. Common passenger cars			.50
19. Vestibuled baggage cars			.50
20. Common baggage cars			.30
21. Taking out carpets, seats, draperies, from parlor and sleeping cars and beating them, per car			1.00
22. Taking out and beating cushions and backs of seats of passenger cars, (vestibuled or common), per car			.65
No additional charge for cleaning trucks of parlor or sleeping cars.			
23. Domes, gas, each			.50

		New.	Secondhand.	Scrap.
24.	Diamond S brake shoes, each			1.25
25.	Gas, Pintsch, per receiver			.85
26.	Gas, labor filling, per receiver			.08
27.	Globes, gas, 4-inch, each			.50
28.	Globes, opal gas, each			.50
29.	Glass, per light			At cost
30.	Glass, setting, per light			.20
31.	Hose, air-brake or signal, complete with fittings, each			1.75
32.	Hose, air-brake or signal, credit for fittings, each			.80
33.	Hose, steam, complete with fittings, each			5.00
34.	Hose, steam, credit for fittings			4.00
35.	Ice (including labor), per cwt.			.25
36.	Iron, cast, per lb.			.01¾
37.	Iron, cast, credit, per lb.			.006-10
38.	Iron, malleable, per lb.			.03
39.	Iron, malleable, credit, per lb.			.00½
40.	Labor, on lubrication, per hour			.20
41.	Labor, on repairs, per hour			.25
42.	Lumber, oak, pine, hickory, poplar and elm, per foot			.03
43.	Oil, Galena, car, per gal.			.22
44.	Oil, Galena, coach, per gal.			.35
45.	Oil, illuminating, American roads to charge, per gal.			.11
46.	Oil, illuminating, Canadian roads to charge, per gal.			.16
47.	Shades, Acme, lamp, each			.45
48.	Shades, common lamp, each			.25
49.	Steel, spring (not springs), per lb.			.04
50.	Steel, springs, credit, per lb.			.00¾
51.	Steel castings, per lb			.04½
52.	Steel castings, credit, per lb.			.00¾
53.	Tallow, per lb.			.06
54.	Waste, woolen, per lb.			.12½
55.	Waste, cotton, per lb.			.06
56.	Wicks, round, each			.02
57.	Wicks, dual, each			.00½
	Wheels, cast:			
58.	36 inch, each	$10.00	$7.50	5.00
59.	33 inch, each	8.50	6.75	4.50
60.	Wheels, new steel, each			Cost.
61.	Wheels, secondhand and scrap steel, $1 per 1/16-inch in thickness of tire, unless tires are loose or broken			
62.	Loss of metal from steel-tired wheels, $1.50 per 1/16 inch.			
63.	Labor, changing per pair			2.00
64.	Removing, turning and replacing steel-tired wheels, per pair			7.00
65.	Steel-tired, cost of re-tiring to be cost with the addition of freight charges.			

The report is signed by J. T. Chamberlain, Chairman; G. W. Wildin, F. N. Hibbits, F. W. Chaffee, R. W. Burnett.

SUBJECTS.

The committee on subjects suggests the following for committee investigation during the year 1905-06:

A Standing Committee on Car Wheels.—The committee on subjects deems this subject of sufficient importance for a committee to report from year to year on all subjects pertaining to design and specifications of cast-iron wheels.

The use of metal in passenger equipment car construction.—A committee to report on the advisability of the use of metal in passenger equipment car construction.

Brake-Beams.—A committee to prepare and submit specifications and tests for brake-beams for 60,000, 80,000 and 100,000 lbs. capacity cars.

Bolsters.—A committee to prepare and submit specifications and tests for bolsters for 60,000, 80,000 and 100,000 lbs. capacity cars.

The use of four-wheel versus six-wheel trucks for passenger service.

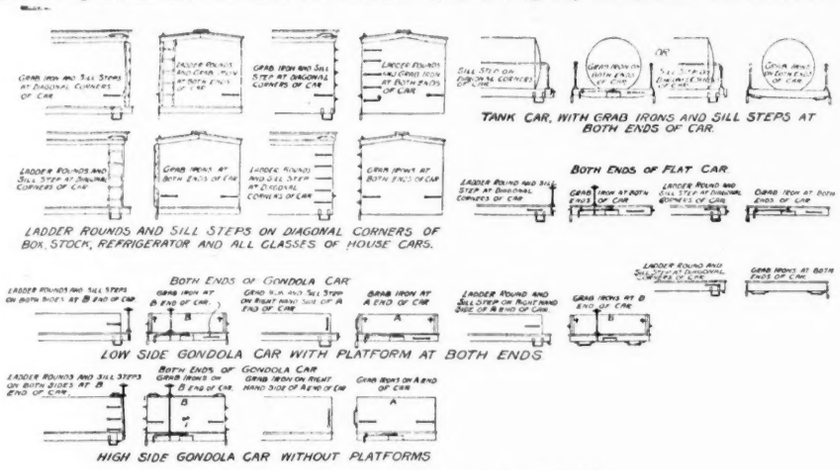
As to the efficiency of the different designs of side bearings.

Investigation of damage to cars, due to switching; including "hump-yards."

The use of cast-steel and wrought-iron in car construction, and their limits.

Pressed steel shapes in passenger car design.

The use of truss rods in passenger equipment cars.


TANK CAR, WITH GRAB IRONS AND SILL STEPS AT BOTH ENDS OF CAR.
BOTH ENDS OF FLAT CAR.
LADDER ROUNDS AND SILL STEPS ON DIAGONAL CORNERS OF BOX, STOCK, REFRIGERATOR AND ALL CLASSES OF HOUSE CARS.
BOTH ENDS OF GONDOLA CAR
LOW SIDE GONDOLA CAR WITH PLATFORM AT BOTH ENDS
HIGH SIDE GONDOLA CAR WITHOUT PLATFORMS

Position of Grab Irons and Hand Holds.

The report is signed by J. S. Chambers, Chairman; F. T. Hyndman, O. M. Stimson.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE.

Journal Boxes and Details.

The committee is of the opinion that the inside dust-guard plate should be cut out and the sides of the box allowed to remain vertical. This recommendation is made for the reason that the plate now in the boxes is of no value at the bottom end, because it allows the dust to form and in time it wedges the dust guard tight, preventing it from having any movement. The above recommendations apply to the four standard journal boxes.

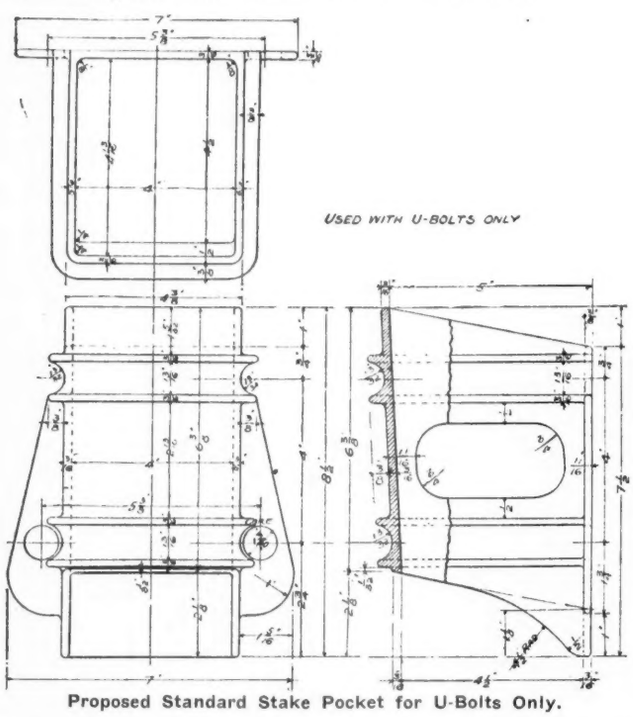
It is the opinion of the committee that an improvement in the present journal-box lids can be made by the addition of a rib on the back face immediately within the inside of the oil box, as indicated on the drawing herewith.

Brake Head and Shoe.

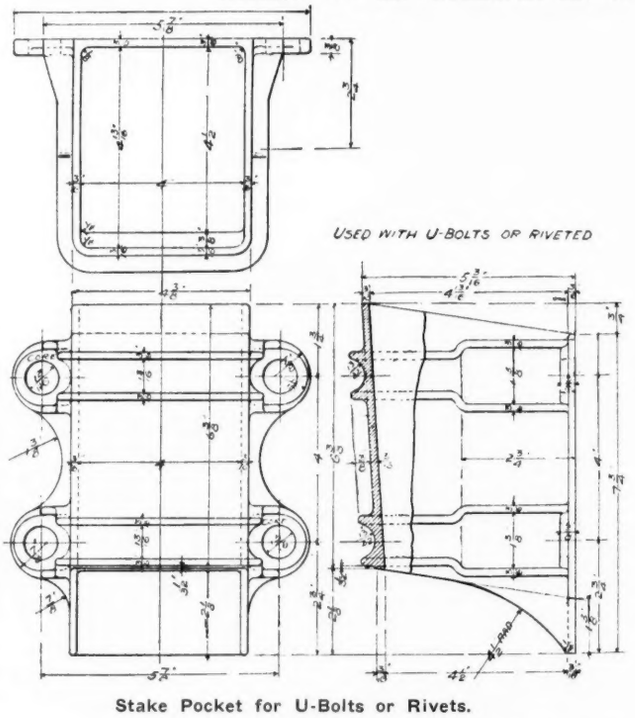
It is the recommendation of the committee that the standard brake shoe be modified by the addition of a rib on the sides as a means of strengthening to prevent breakage. It is also recommended that the length of the shoe be increased 1¼ in. at each end.

Brake Beam.

It is the opinion of the committee that the recommendation made by the Air-Brake Association last year that the distance from center to center of the brake head should



Proposed Standard Stake Pocket for U-Bolts Only.

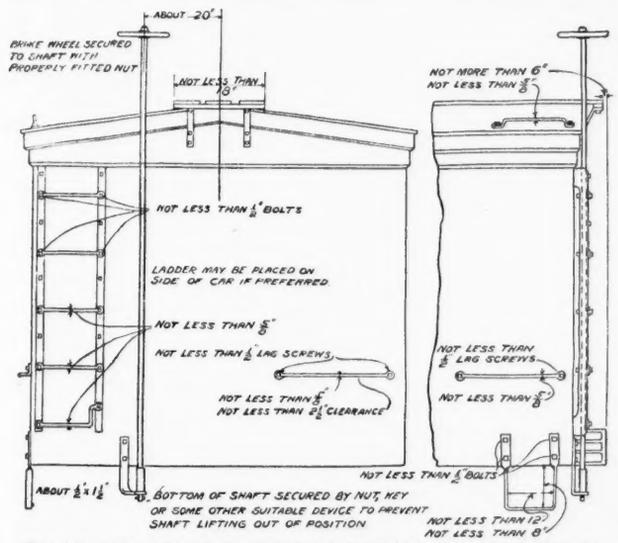


Stake Pocket for U-Bolts or Rivets.

be reduced from 60½ in. to 60 in., is a good one, and it is recommended to the Association.

Standards for Protection of Trainmen.

The committee believes that the location of safety appliances on cars should be more clearly defined, and therefore presents a drawing showing handholds, steps, ladders, etc., applied to the different classes of cars, which it would recommend to be substituted for the drawings now shown.


ABOUT 20"
BRAKE WHEEL SECURED TO SHAFT WITH PROPERLY FITTED NUT
NOT LESS THAN 16"
NOT LESS THAN ⅝" BOLTS
LADDER MAY BE PLACED ON SIDE OF CAR IF PREFERRED.
NOT LESS THAN ⅝"
NOT LESS THAN ⅝" LAG SCREWS
NOT LESS THAN ⅝" NOT LESS THAN 2½" CLEARANCE
ABOUT 1½ x 1½"
BOTTOM OF SHAFT SECURED BY NUT, KEY OR SOME OTHER SUITABLE DEVICE TO PREVENT SHAFT LIFTING OUT OF POSITION
NOT MORE THAN 6"
NOT LESS THAN ⅝"
NOT LESS THAN ⅝ LAG SCREWS
NOT LESS THAN ⅝
NOT LESS THAN ½" BOLTS
NOT LESS THAN 12"
NOT LESS THAN 8"

POSITION OF BRAKE SHAFT STEP LADDER AND RUNNING BOARD.

In the construction of special equipment, grab-irons or handholds should be placed on both ends of the car; sill steps and ladder rounds at the B end of car. If the construction is such as to add an element of safety, they should also be placed on the right-hand side of the A end of car.

Center Plates.

It is the opinion of the committee that the center plate as now constructed is satisfactory, but it would recommend that the position of the members be reversed, and the one now used for the body be used on the truck, and vice versa. This recommendation is made, owing to the fact that the truck member, when lubricated, catches dust, and it wedges in so tightly that it is difficult to get the two members apart. This difficulty would be entirely avoided if the plates were reversed.

Uncoupling Arrangements.

The committee recommends a new design of uncoupling rod bracket having the shoulder beveled as shown in the drawing herewith, the object of which is to obtain a greater range of the lifting movement in the locking bar and pin, as large numbers of defects are reported by the Interstate Commerce Commission inspectors of lifting chains too short or too long. The present standard permits of but one position; the recommended change, by the use of a beveled face of bracket, permits a range of lift to any desired height.

Permanent Stake Pockets.

At the convention of 1904 the Committee on Stake Pockets submitted two forms of pockets, one to be used with U-bolts only, the other with U-bolts or riveted. After some discussion, the report and its recommendations were referred to the Committee on Revision of Standards. The only objection the committee has to make to the forms proposed is to the bevel in back of pocket; it believes the bevel should be in front of pocket, and therefore submits revised drawings showing this modification.

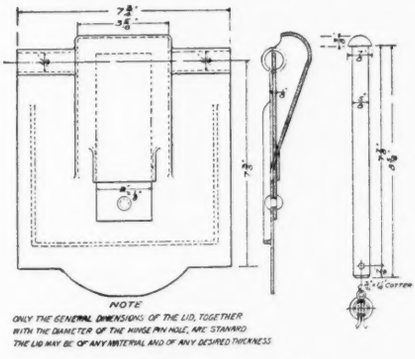
The recommendations the committee would make are as follows:

1. That a standard stake pocket be adopted as shown herewith.
2. That the method of securing stake pockets to cars of wooden construction be by U-bolts; to cars of steel construction, by rivets or U-bolts.
3. That malleable iron be used as standard construction.
4. Stakes should be located to suit the construction of the car or the requirements of the service, but should not be placed farther apart than 4 ft. from center to center.

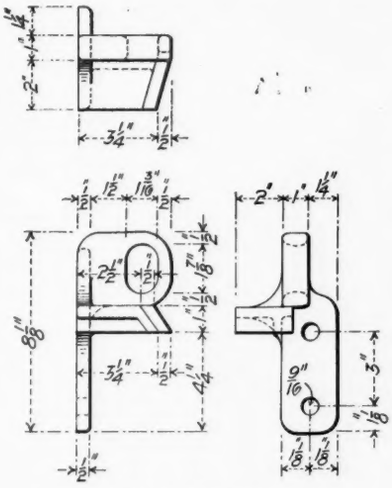
Temporary Stake Pockets.

The practice on a number of roads is to apply stake pockets to side sills of coal and gondola cars and temporary stake pockets or straps to sides of cars. The committee considers this good practice and recommends that this class of cars be equipped in the above manner; that the temporary pocket or strap be 4¼ by 5¼ in. inside dimensions, so as to receive standard stake; that the material for this temporary pocket or strap be not less than ½ by 2½ in.; that it be secured by bolts or rivets.

The report is signed by C. A. Schroyer, Chairman; M. Dunn and T. S. Lloyd.


NOTE
ONLY THE GENERAL DIMENSIONS OF THE LID, TOGETHER WITH THE DIAMETER OF THE HINGE PIN HOLE, ARE STANDARD. THE LID MAY BE OF ANY MATERIAL AND OF ANY DESIRED THICKNESS

Journal Box Lid and Pin.



Uncoupling Rod Bracket.

REVISION OF RULES FOR LOADING LONG MATERIALS.

The revision of the code of rules for loading long materials affects only 18 sections, the other sections remaining as now in force. The committee report explains the reasons for making the changes quite fully, and it is believed that as amended the rules will satisfactorily cover the loading of such shipments from the standpoint both of the shipper and the railroads. Inasmuch as the rules as amended will be submitted to the Association for discussion and letter ballot before final adoption, they are not reprinted here. The report of the committee is signed by the following members: A. Kearney, Chairman; W. C. Fowler, A. Stewart, T. H. Curtis, F. H. Clark, W. F. Kiesel, Jr., L. H. Turner.

TESTS OF M. C. B. COUPLERS.

The question of the adoption of a standard design of automatic coupler was forcibly brought out by the President in his address before the convention last year, and was later referred by the Executive Committee to the coupler committee for consideration. As this is probably the most important coupler question which has come before the Association since the adoption of the M. C. B. contour lines in 1888, there can be no doubt that there is urgent need for some concerted action by the railroads of the country, looking toward a reduction of the large number of types of couplers now in use, with a view of eliminating those of weak design and poor construction. The large sums of money invested in the great variety of coupler parts which it is necessary to carry in stock at repair yards is a convincing argument that some action should be taken to relieve the present conditions.

The ideal arrangement would be the universal use of but one design of coupler, and the future policy of the Association must depend upon the question as to how near and in what manner to approach this ideal. After deliberate consideration of the various phases of this subject, the committee has concluded that it would be best not to offer any definite recommendation as to the policy to be adopted; but it would suggest that the Association consider the following schemes in whatever action may be taken:

First.—That the coupler committee be empowered to act in conjunction with a specially appointed committee (in which should be included representatives of the manufacturers) to early decide upon a composite design of coupler which shall contain as far as possible the desirable features of the best couplers as now designed, and that all patent rights involved be waived and all manufacturers be permitted to manufacture the composite coupler as adopted.

Second.—That the present policy of the Association be followed out—that is, that the gradual improvement of the M. C. B. standard coupler and the elimination of poorly designed and weak couplers be carried on as at present by making the requirements to be met by the M. C. B. coupler more and more rigid, thus compelling a higher degree of efficiency, and closely prescribing the limits for the future within which designers may work, while at the same time in no way preventing beneficial competition.

Specifications.

The specifications for M. C. B. couplers have been used, in practically their present form, since 1901, and are to-day giving satisfaction as a check on the design, workmanship and the material in couplers. That good results have not been universally felt is due to the reluctance of the railroads to

buy their couplers under these specifications; although the specifications are far from being in general use, it is the opinion of the committee that the time has come when action should be taken by the Association looking toward enforcing their use.

The committee recommends that the specifications for M. C. B. couplers, which are at present recommended practice, be advanced to standard as a step toward enforcing a higher efficiency in couplers and relief from delays to traffic due to their failure. Making the specifications a standard of the Association will necessitate some minor changes in their reading to avoid repetition of features already standard; also an addition to them is necessitated by the change to standard, and the committee therefore recommends the following:

Paragraph 4 to be changed as follows: "Couplers must conform to M. C. B. standard drawings and contour lines, and must have a lock set within the head of the coupler. They must couple and uncouple with each other (with either or both knuckles open) and also with the master or sample coupler; they should lock easily when the knuckle is pushed in by hand. They must have steel pivot pins 1¾ in. in diameter, of sufficient length to permit applying a ⅜-in. cotter pin through the pin below the coupler lug. Pivot pins, after having the heads struck up, must be properly annealed."

Paragraph 8 to be added as follows: "Every coupler complying with the above requirements must have legibly cast in raised letters on the head, and in plain view where they will not be worn off, the letters 'M. C. B.'; this mark to be evidence that the coupler is an M. C. B. standard."

Worn Coupler Limit and Wheel Defect Gage.

The worn coupler limit and wheel defect gage (M. C. B. Sheet "A"), which was adopted last year as recommended practice of the Association, seems to be giving entire satisfaction from a coupler standpoint. From information gathered by investigation, and from the replies of the members to the circular of inquiry, the limiting dimension of 5⅛ in. is the correct one. The committee has record of cases where both mating couplers measured 5⅛ in., and did not part, and also cases of parting when one coupler measured 5⅛ in. and the other 5¼ in., which indicates that 5⅛ in. is about the maximum limit for safety. To bring the wheel defect features of this combination gage into closer agreement with the present standard wheel defect gage and with a view of the combination gage becoming a standard, the committee has made some slight changes in its form (retaining, however, the 5⅛-in. over-all dimension), and presents the gage shown, Fig. 1. A gage so designed proposes only one change over the present standard wheel defect gage, and that is in the location of the 2½-in. dimension for determining flat spots; this has been moved to the back of the gage in order that it may be made narrower and lighter, and more conveniently carried by inspectors.

The committee would recommend that this gage be made a standard of the Association.

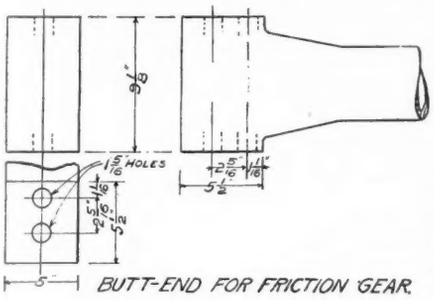
Knuckle Designed Not to Pull Out When the Knuckle Pin Breaks.

Many of the couplers now on the market are so designed that the knuckle will not pull out in the event of the breakage of the knuckle pin. This feature is certainly an improvement, as it affords support to the pivot pin in carrying part of the load when the pin becomes worn or bent, and it is also a safety device to prevent partings when the pin breaks.

Nearly all of the replies to the circular of inquiry sent out among the members were favorable to this feature, and the committee therefore recommends that couplers so designed as not to part when the knuckle pin is removed or broken be specified by the members in the purchase of all new couplers after Jan. 1, 1906, and that the Association adopt this feature as recommended practice for M. C. B. couplers.

Uncoupling Attachments.

The committee was assigned, by the Executive Committee, the duty of designing and presenting to the Association improvements in uncoupling attachments for automatic couplers. On account of this subject being so widely covered by patented devices, the committee has found it impossible to design



BUTT-END FOR FRICTION GEAR.

an arrangement which it could submit with recommendations for the use of the Association.

Knuckle-Throwing Device.

In order to avoid the necessity of trainmen stepping between the cars to open the knuckle prior to the act of coupling, it would seem advisable to have a knuckle-throwing device; and out of a total of 25 railroads answering the question, "Are you in favor of a knuckle-kicking device?" 23 replies were in the affirmative.

Up to the present time a very small proportion of the cars have been equipped with couplers having knuckle kickers, and very few good designs of kickers are on the market. Under the circumstances, it would not be just, in the opinion of the committee, to compel the use of a knuckle-throwing device at this time, but on account of the more or less rapid change in couplers due to the replacement of the weaker designs, which are constantly failing, it would seem advisable to have the Association place itself on record that it is in favor of a knuckle-throwing device.

The committee does not believe that there is any question of opposition to the principle of a knuckle-throwing device, but there seems to be a doubt in some quarters as to the advisability of adopting same, on account of the inefficiency of a number of designs which have not only failed in their function after being worn somewhat, but have interfered with the proper working of some of the other parts of the coupler. A kicker is certainly a safeguard and, in time, will be regarded as a necessity; but before this period is reached improvements should be forthcoming to give the railroads a positive kicker which will throw the knuckle completely open and operate under all conditions of wear and service.

The committee, therefore, recommends that the Association place itself on record as being in favor of a knuckle-throwing device by adopting it as recommended practice for M. C. B. couplers.

Lock Located Centrally Within the Head.

It has been forcibly brought to the attention of the committee that the necessity exists for having the lock so located within the head between the striking horn of the coupler and the contour lines that the eye of the lock lift to which the uncoupling rigging is attached will be in the central longitudinal vertical plane of the coupler, enabling the lock to be operated from the top of the coupler head. A uniform location of the lock pin has, in the opinion of the committee, decided advantages and will avoid the necessity of changing the uncoupling rigging when change of couplers is required.

The difficulty of changing the uncoupling rigging when necessary to replace a coupler having the side operating lock, with one equipped with the lock centrally located, is a well-understood fact. The greater majority of designs of couplers have the lock central within the head, which affords the best possible location for the release rigging, which is a strong argument, in the opinion of the committee, for the adoption of the central location of lock as recommended practice.

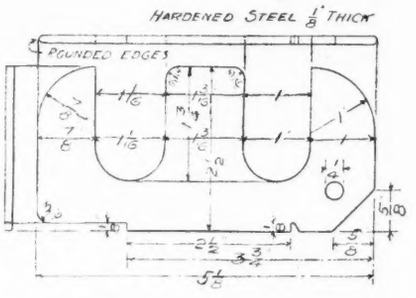
Auxiliary Coupler for Short Curves.

During the past year the committee has experimented with a large number of auxiliary couplers designed for use on the very short curves found in large cities at such places as warehouses, industrial works, etc. In one case, automatic coupling and uncoupling has been secured under all conditions and degree of curvature, and all positions of the car on the curve; but the device is still in an experimental stage.

Knuckle Pivot Pin.

A majority of the replies received from the members in answer to the circular of inquiry were strongly in favor of improving the material used in the manufacture of the knuckle pins; an examination of the scrap piles in metal yards and freight shops clearly indicates that failure of the knuckle pins is too serious a matter to neglect. The breakage of the knuckle pins has become the direct cause of many serious partings on the road since the adoption of the solid knuckle, and a large portion of the break-in-twos attributable to couplers is directly due to the knuckle pins breaking.

Examination of these broken pins reveals the fact that they do not generally break by direct shear, but probably fail through repetition of shock strains. But if pins could be obtained that would resist this treatment, with a hardened surface, it would be pos-



WORN COUPLER LIMIT AND WHEEL DEFECT GAUGE.

sible to considerably reduce this trouble; what is desired is a pin with a high resistance to wear and to breakage by shock strains.

The committee cannot present definite specifications at this time, but complete tests are under way which will enable it to offer recommendations at the convention next year.

A number of shearing tests were made with knuckle pins taken from stock in order to determine the ultimate load in pounds per square inch, and the committee appends the results of these tests as a matter of information, and would direct attention to the

lack of uniformity of the ultimate load in pounds per square inch.

Test of Various Makes of Knuckle Pins.

Name of pin.	No. test.	Di-men-sion.	Area.	Ultimate load.	Ultimate load, lbs. sq. in.
A—Janney*	1	1.375	1.485	122,700	41,300
	2	1.375	1.485	123,600	41,600
	3	1.375	1.485	123,000	41,400
Average					41,433
B—Kelso*	1	1.638	2.107	177,800	42,190
	2	1.640	2.112	185,000	43,800
	3	1.640	2.112	189,300	44,800
Average					43,569
C—Gould†	1	1.550	1.887	300,000	79,500
	2	1.550	1.887	300,000	79,500
	3	1.550	1.887	300,000	79,500
Average					79,500
D—Chicago‡	1	1.496	1.758	300,000	85,300
	2	1.492	1.748	300,000	85,800
	3	1.495	1.755	296,000	85,450
Average					85,516
E—Detroit*	1	1.560	1.911	194,200	50,800
	2	1.560	1.911	184,700	48,315
	3	1.562	1.892	170,000	44,930
Average					48,015
F—Gould*	1	1.648	2.133	182,200	42,710
	2	1.650	2.138	188,300	44,000
Average					43,355
G—Melrose§	1	1.635	2.100	300,000	71,400
	2	1.618	2.056	300,000	72,950
Average					72,175

Remark: *Janney, Kelso, Detroit, F—Gould, all tests sheared. †C—Gould: 1 Bent through center .17: 2 and 3 Bent through center .20. ‡Chicago: 1 Bent through center .24: 2 Bent through center .27: 3 Sheared near head of pin. §Melrose: 1 Not sheared.

Recommendations.

1. Present specifications for M. C. B. couplers, which are now recommended practice, with the modifications and additions suggested in the body of this report, be made standard.

2. Worn coupler limit and wheel defect gage (Fig. 1) be adopted as standard, superseding wheel defect gage on M. C. B. Sheet 12, and annulling worn coupler limit gages shown on M. C. B. Sheets "A" and "G."

3. Knuckle designed not to pull out when knuckle pin fails be adopted as recommended practice.

4. Knuckle-throwing device be adopted as recommended practice.

5. Knuckle lock lift to be in the central longitudinal vertical plane, located between the striking horn and contour lines, and operate from the top by an upward movement, be adopted as recommended practice.

6. That the additional dimension, "Not less than 20¾ in.," be added on the plan view of 5 by 7-in. coupler on M. C. B. Sheet 11, to definitely locate the point at which the shank shall measure 7 in.; this dimension will prevent designers from moving the 1-in. radius (connecting the head and the shank) back too far, thus reducing the lateral coupler clearance in the carrier iron below the prescribed limits.

7. That the coupler "Tail End for Continuous Draft," shown on M. C. B. Sheet 11, be removed as being unsuited for approved practice in car construction, as recommended by the committee on draft gear in its report to the convention of 1904.

8. The enlarged butt for the 5 by 7-in. shank for friction gear, as shown on Fig. 2, be adopted as recommended practice, to conform to the yoke dimensions for butt, recommended by the committee on draft gear last year.

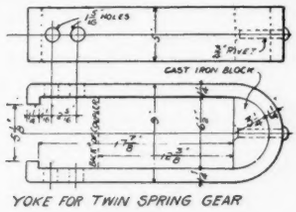
Draft Gear Report.

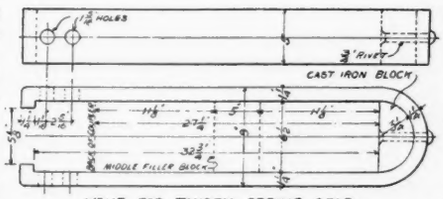
The coupler committee was requested by the committee on supervision of standards and recommended practice to take up the points raised in the report of the committee on draft gear last year, and present them to the Association, along with the regular coupler report. The report of the draft gear committee was referred by the convention last year to the committee on standards, which in referring it to the coupler committee, states that as this subject is really very closely allied to the development of the M. C. B. coupler, any improvement that is likely to affect both coupler and draft gear should be handled by the same committee.

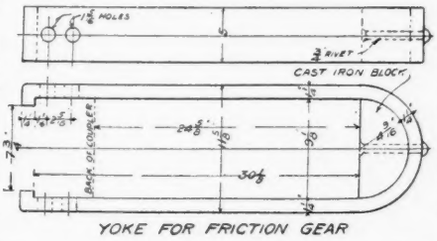
The coupler committee concurs with the "general recommendations" made in the draft gear report last year, namely, that unless some of the principal details can be decided upon, the presentation of a complete design as a substitute for present recommended practice would be impossible; if limiting dimensions could be adopted within which designers might work, the benefits derived would be considerable, and it is, therefore, with this idea in mind that the following definite recommendations are made:

Follower.

Followers should be made separate from the yoke-filling piece, for the reason that, should they be integral with the filling piece, the shape would necessitate a casting—either malleable or steel—and experience has shown that castings are too unreliable,







being subject to inherent defects, for this severe service. When castings are used, two different patterns are required, one for the front and the other for the back follower, necessitating an increase of the stock of material carried in the repair yards; whereas, should they simply be rectangular pieces of wrought-iron or steel, both followers can be of the same design and interchangeable, and experience has demonstrated that the wrought-iron followers are practically free from failure. Any breakage of followers necessitates the taking-down of draft gear, which operation is expensive with all types, besides involving the loss of service of the car. Another reason why it is thought best that the follower and filling piece should be made separate is that, in some designs of cars, it is probable that there would be insufficient room for the proposed yoke (with the semi-circular back end), as these yokes are necessarily longer than a yoke with a flatter back; a shallower filling piece and shorter yoke would then have to be used, while no change would be necessary in the follower; interchangeability would thus be simplified. The committee would not advise that it be left optional as to whether or not the filling piece and follower be combined, but would recommend that followers be made of wrought-iron or open-hearth steel, 1⅝ in. thick for tandem spring gear, and 2¼ in. thick for twin spring and friction gear.

Gibs or Lugs on Coupler Yoke.

Owing to the impossibility of making the long rivets (used in fastening the coupler to the yoke) completely fill up the holes, motion will, in time, take place between the coupler butt and the yoke, resulting in all the strain being carried by the rivets in shear (if there are no lugs) and very little, if any, by friction; on this account it would not be satisfactory to omit the lugs on the yoke. When these lugs are upset square and fit snugly against the shoulder on the coupler butt, there is no question but that they afford considerable support to the rivets, and an examination of a large number of yokes removed from couplers on account of coupler failures, has shown that the lugs have really been carrying the load, which is evident from the fact that the inner surface of the gibs had been worn smooth and bright. Lugs should be formed by upsetting the metal, and never by welding.

Yoke.

The standard yoke or pocket of the Association is now 4 in. wide by 1 in. thick, and frequent failures have shown that it is weak at the back corners and also through the rivet holes and lugs (which latter are very often found broken off) even on cars of 60,000 lbs. capacity. To secure sufficient strength of this important detail of the draft gear and to provide for increase in size of rivets and for the increased hauling capacity of locomotives, the committee recommends that the form of yoke shown in Fig. 3 be adopted as recommended practice of the Association.

The section of bar in Fig. 3 has been made 5 by 1¼ in., for the reason that it has been found that this size is none too large. A few 5 by 1¼-in. yokes have failed in service, indicating that they are strained up to their full capacity, and that if yokes are made of bars of smaller dimension the number of failures will be considerably increased and the cost of repairs will greatly exceed the difference in first cost.

The committee also recommends that the shape of rear end of yoke be optional and of any desired form, provided the liner introduced is made of wrought-iron or open-hearth steel not less than 1 in. thick at center. The semi-circular shape with cast-iron filling block is preferred in all cases where clearances will permit.

The yoke for tandem spring gear as formerly used, conforming to figures in report of committee on draft gear in 1904, has been increased in length to provide for a 5-in. center block, the 4-in. block having been found too weak. The dimension from yoke-filling block to back of coupler has been made 27¼ in. to provide for four 1⅝-in. followers, too 8-in. draft springs, 6¼ in. outside dimension compressed to 7⅞ in. each, and a 5-in. center block.

Size and Spacing of Rivets.

From general experience, the number of breakages of the 1⅛-in. rivets is excessive and, in the opinion of your committee, of sufficient seriousness to warrant an increase in their diameter. This breakage seems to be more common where light yokes are used, which can be explained only by the fact that the reinforcement offered by the lugs is more effective in the case of the heavier yoke, and consequently less load is thrown on the rivets. If a good, tight bearing could always be obtained between the yoke and

the coupler, it is probable that the 1⅛-in. rivet would be found strong enough. Rivets invariably fail some time after they have become loose.

Another prolific cause of the failure of the rivets (and the yoke through the rivet holes) is the severe side strains thrown on the draft rigging in taking short curves. In this condition the rivets are subject to a severe load applied at the coupler head.

But it is almost impossible to insure a tight fit between rivets, yoke and coupler, on account of the necessity of using long rivets which are heated only at one end, for which reason the hole at the cold end cannot be completely filled. In addition, it should be stated that the tension on the rivets is insufficient to provide the necessary frictional resistance for relief in shear. For these reasons the committee believes that it would be advisable to increase the diameter of the rivets to 1¼ in., with no change in their spacing.

The committee's reason for advising an increase to 1¼ in., instead of 1⅜ in., is that should the latter diameter be chosen, it would be necessary to change the design of the butt of the coupler—that is, the length of the riveting block would have to be increased and the holes respaced to obtain sufficient metal between them to avoid breaking through between rivet holes.

This change would mean carrying two styles of couplers and yokes in stock; whereas, it is not absolutely necessary to make any change in the spacing of the holes when 1¼-in. rivets are used and present couplers can be used by simply reaming out the holes.

The committee concurs with the draft gear committee in its opinion that the recommended practice as shown on M. C. B. Sheet "B" for attachment of automatic couplers to cars be withdrawn, as not being of sufficient capacity for modern cars; and it also concurs in the conclusion of the report which calls attention to the necessity of using on all wooden construction some form of cheek plate, in which the front and back stops are united in one piece, this plate to be of "L" or "T" shape, so that the bolts may pass vertically through the center and draft sills, as well as horizontally through the center or draft sills.

Many cars are still being built or perpetuated in which short draft timbers are being used, secured to the longitudinal sills by an insufficient number of bolts. When the draft timber does not extend through the body bolster, heavy rods should be used, with front ends secured to draft gear, passing through the body bolster and the tie timber to which they are secured. Anchor blocks should also be used between the sills and draft timbers, and continuous filling blocks should be used extending from bolster to bolster and securely fastened to bottom of center sills, to give continuous resistance to the draft timbers.

The committee asks that the above recommendations be submitted to letter ballot for adoption as Recommended Practice.

The report is signed by R. N. Durborow, Chairman; Joseph Buker, W. S. Morris, W. P. Appleyard, F. H. Stark.

TRUCK ARCH BARS FOR 100,000-LBS. CAPACITY FREIGHT CARS.

Realizing the wide difference in opinion with respect to the various types of truck arch bars in use on freight cars, the weight of which, including lading, is 150,000 lbs., it was decided to submit a list of questions to all members of the Association for the purpose of obtaining data and information pertaining to the practice of railroads operating under similar and different conditions.

Replies to the circulars of inquiry were given by 14 railroads and car builders, and from the information received, the committee suggests that the following conclusions shall be submitted to the convention for adoption:

First.—The distance between wheel centers to be 5 ft. 6 in.

Ten replies out of the total number received specified this spacing, which the committee considers necessary to provide a sufficient amount of room for a substantial design of truck bolster and column castings, and for the proper suspension of inside brake beams and application of brake heads and shoes.

Second.—The cross section of the top and inverted arch bars to be 6 by 1¼ in.

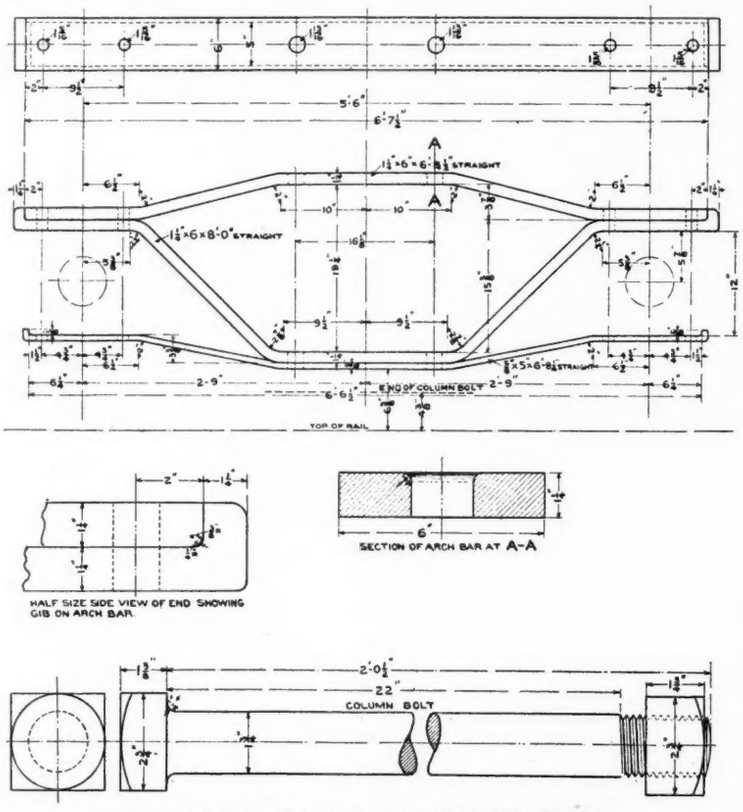
The tendency has been, and will be, to increase the average loading per car, especially in the vicinity of the coal, ore, structural steel, quarry and other districts where business originates which will necessitate the use of the greatest proportion of 100,000 lbs. and heavier capacity equipment. It has been found that sections of inverted arch bars 5 by 1¼ in. have failed within a few years after having been put into service. These failures have occurred principally in the bends at the base of the column castings and through the column bolt holes, and an examination has indicated that even with a good quality of wrought-iron material and proper truck construction detail and entire fractures have developed at these points. Furthermore, the column bolt holes have shown a slight tendency to elongate, with a corresponding reduction in the thickness of the section, indicating that there is not sufficient metal at this point for the stress. The replies, as well as the practice in vogue at the present time, indicate the necessity for making use of a section larger than 5 by 1¼ in., and in order to provide for the best distribution of metal at the weakest point in the inverted arch bar, it has been thought advisable to increase the width to 6 in. The reasons for increasing the cross sectional area by widening rather than by thickening the arch bars are, greater strength with equivalent weight, more lateral stiffness, reduced liability for overstraining, less distortion of cross section in forming, greater uniformity in the section and quality of material, and reduced expense for construction and maintenance. It is not considered necessary to have a larger section of top arch bar than inverted arch bar, and the advantage to be derived from making both sections of the same dimensions is apparent.

Third.—The section of tie bar to be 5 by ⅝ in.

Seven of the replies received specify the use of tie bars 5 by ⅝ in., and from the general information given, as well as the results from practice, it is thought that this section will be entirely satisfactory in connection with the 6 by 1¼-in. arch bars.

Fourth.—The inverted arch bar to be gibbed to provide a bearing for each end of the top arch bar.

This practice is recommended, as from service and drop and other tests, it has been found that a bearing for the ends of the top arch bar against the ends of the inverted arch bar will produce greater stability, provide for the maximum benefit from the top arch bar, and at the same time, reduce the shearing effect on the journal-box bolts. It will also increase the strength and stiffness of the arch bar frame as a whole and give a greater factor of safety under the increasing average loads to be carried.



Proposed Design of Arch Bars for 100,000-lb. Trucks.

Fifth.—The tie bars to be gibbed at the ends.

This practice is recommended for the reason that service records indicate that the wear on the threaded portion of the journal-box bolts and the elongation by wear of the journal-box bolt holes in the tie bar has been considerably reduced where the gibs were used, and this result is considered an advantage that will justify the application of this feature.

Sixth.—The set of the top arch bar to be 3⅞ in.

From the replies received, three specify

the use of the 3⅞-in. dimensions, two 3¾ in., and the others vary from 1 to 5 in. The five railroads using the 3⅞-in. and 3¾-in. set represent a freight equipment of 334,645 cars, of which 71,355 cars are 100,000 lbs. capacity.

Seventh.—The distance between the top and inverted arch bars to be 19¼ in.

General design and practice have indicated that this dimension is the proper one to be used with the set of 3⅞ in. for the top arch bar, and in connection with the M. C. B. truck bolster spring, in order to provide for sufficient depth and strength at the end of the truck bolster, as well as space for a substantial spring seat which will clear the through bolts securing the ears of the column castings to the spring channel.

Eighth.—The set of the inverted arch bar to be 15⅜ in.

The set of the top arch bar and the distance between the top and inverted arch bars having been determined, the above dimension must follow.

Ninth.—The set of the tie bar to be 3⅜ in.

This dimension is determined by the M. C. B. journal box.

Tenth.—The distance from center to center of column bolt holes to be 16⅛ in.

This spacing has been found sufficient to provide for a suitable design of truck bolster giving ample transverse strength. It will also provide for sufficient strength in either cast-iron, malleable iron or cast-steel column castings, and accommodate the use of M. C. B. bolster springs.

Eleventh.—All column and journal box bolt holes to be $^1/_{16}$-in. larger than the diameters of the bolts.

This will conform to the established practice.

Twelfth.—The distance between the top of the track rails and the bottom of the tie bar to be 6⅜ in.

It is thought that the above dimension should be adopted to provide the necessary space for the M. C. B. bolster springs and substantial truck bolsters, and give sufficient clearance between the top of the bolster and the under side of the top arch bar.

Thirteenth.—The distance between the top of the track rails and the lower end of the column bolts to be not less than 4⅜ in.

The features considered in establishing this distance are the required clearance at road crossings, for Wharton type switches, etc., and to allow for the usual wear of journal bearings, journals, treads of cast-iron wheels, and for the reduction in diameter of steel-tired and rolled-steel wheels.

Fourteenth.—The diameter of the column bolts to be 1¾ in. and these bolts to be fitted with combined washers and nut locks at the head of the bolt and at the nut, and with the U. S. standard square heads and nuts. The top arch bar to have the column bolt holes countersunk on the upper side to take a ¼-in. radius fillet under the head of the column bolt.

Fifteenth.—The radii at the bends of the top arch bar to be 2 in., and to the inverted arch bar at the column casting 2⅞ in.

Sixteenth.—The radii of the inverted arch bar at the journal box to be 2¼ in.

Seventeenth.—All other dimensions to conform to the present M. C. B. standards.

Eighteenth.—The material preferable for arch and tie bars and column bolts is good wrought-iron, this being better able to withstand distortion without detail or entire fracture.

When the best quality of wrought-iron is not attainable, a good medium carbon, low phosphorus and sulphur, open-hearth steel can be used for arch and tie bars. The use of Bessemer steel is not recommended under any circumstances.

Specifications for Arch Bars.

(1.) *Iron.*—To be made of a tough fibrous wrought-iron free from admixture with steel scrap. The bars must be smoothly and accurately rolled to dimensions and free from slivers, depressions, cracks and burned edges, with a tensile strength of from 47,000 lbs. to 53,000 lbs. per sq. in. The elongation as rolled must be not less than 16 per cent. in 8 in., or when reduced as in a test specimen the iron must have a tensile strength of at least 46,000 lbs. per sq. in. with an elongation of 15 per cent. in 8 in. It must stand a nicking and bending test as follows:

Piece to be held firmly in a vise and nicked lightly on one side. When broken by a succession of light blows on the nicked side it must show a generally fibrous structure free from admixture of steel.

All bars must be capable of bending either hot or cold, 180 deg. over a mandrel whose diameter is the same as the thickness of the bar, without showing signs of fracture.

(2.) *Steel.*—To be a low phosphorus and sulphur steel, made by the open-hearth process. Bars must be smoothly and accurately rolled to dimensions and must be free from depressions and rough or cracked edges. The finished product must contain less than 0.60 per cent. phosphorus, less than 0.45 per cent. sulphur and less than 0.80 per cent. manganese.

The steel must show an ultimate tensile strength of not less than 50,000 nor more than 65,000 lbs. per sq. in., and an elastic limit of at least 30,000 lbs. When the tensile strength is between 50,000 lbs. and 60,000 lbs. it must have an elongation of at least 26 per cent. in 8 in., and when the tensile strength is between 60,000 lbs. and 65,000 lbs. it must have an elongation of at least 24 per cent. in 8 in.

The engraving accompanying this report shows a top and inverted arch bar, tie bar and column bolt of the recommended design and dimensions for cars, the weight of which, including lading, is 150,000 lbs., as well as for modern freight and switching locomotive tenders, where the use of helical springs is permissible. With the use of the four-coil nest of helical springs and a substantial spring seat casting and channel there is no necessity for any additional reinforcing over the inverted arch bar between the truck column castings.

The report is signed by J. E. Muhlfeld, Chairman; A. S. Vogt, W. T. Gorrell, C. E. Fuller, F. M. Gilbert.

Electric Tramways and Light Railroads in England.

A report of the Board of Trade dated February 21 gives some interesting facts in regard to electric railroads in England for the year 1903-4, with comparative statistics for the years 1879 and 1898. These two years are selected from the 25-year period from 1878 to 1904, 1879 as the year in which horses were most generally used as motive power and 1898 as the maximum year for steam locomotion on light lines. The following table shows the length of lines, number of passengers carried, net and gross earnings, average fare per passenger, and capital invested on British tramways for the three years selected:

	1879.	1898.	1903-04.
Miles of line.	269	1,604	1,840
Passengers:			
Carried	146,000,223	858,485,542	1,799,342,673
Per mile	469,641	806,703	977,961
Net receipts	$1,123,947	$5,120,682	$14,171,783
Gross receipts	5,349,602	22,191,853	41,875,668
Avg. fare.*	3.68	2.46	2.2
Capital	$20,475,069	$80,262,547	235,788,952

*In cents.

There were 38,777 horses and 589 steam locomotives used in 1898, and in 1903-4 only 15,353 horses and 249 steam locomotives. During this same period there was an increase of 7,132 in the number of electric cars in use. At present, over 1,460 miles of line are under electric traction and only 235 miles are operated by horses and 108 by steam.

Of the total of 312 tramway and light railroad undertakings in the United Kingdom, with a total of 1,147 miles of track, 162 are now owned by local authorities, for which a total capital expenditure of $136,556,541 has been incurred. From the profits of these municipal undertakings the sum of $1,007,789 was, in 1903-4, handed over to reduce local taxes. Among the places at which this satisfactory result was achieved were the following:

Sums from the Profits of Municipal Tramways and Light Railroads Applied to Taxes in Certain Cities.

Cities.	Paid over.	Cities.	Paid over.
Leeds	$253,058	Nottingham	$63,264
Manchester	243,325	Salford	58,398
Liverpool	134,661	Hull	55,955
Glasgow	124,662		

Other figures given in the return show that the tramways and light railroads paid $1,400,253 in taxes, and that $6,030,182 was paid in dividends.

Cavite Steel Floating Dry Dock.

BY N. A. BERNER, M.E.

With the new insular possessions the necessity arose for this country of maintaining an adequate naval establishment in the Far East for the support of the fleet, or squadron, that has always, since the occupation, been stationed in Philippine waters. The problem of selecting a suitable base was a very difficult one, as the necessity for docking facilities was very urgent, and the authorities would not run the risk of building docks or arsenals, protected by necessary fortifications, at a place that might later be found unsuitable. The question was referred to Rear-Admiral Mordecai T. Endicott, Chief of Bureau of Yards and Docks, for further investigation. Strengthened by the successful tests of the Algiers steel floating dry dock, the Admiral considered that a floating dry dock was most adaptable on account of the relatively short time required for its completion, and its movability in case of need from one place to the other. The authorities favored these plans and by the Act of Congress, approved July 1, 1902, $1,225,000 were appropriated for the building of a steel floating dry dock for the naval station at Cavite under the direction of the Bureau of Yards and Docks, Navy Department. Instead of asking for bids on specification and design made up by the Bureau of Yards and Docks, the dock builders in the country were given an opportunity to bid on their own plans. Bids for several types of docks were submitted and after thorough comparison the Maryland Steel Company, of Sparrows Point, Md., was awarded, the 20th of April, 1903, the contract to build a dock after a design that is called "the Maryland Steel Company type." The work started at once and Civil Engineer Leonard M. Cox, United States Navy, was assigned to supervise the construction.

The dock is of the general type, consisting of three sections so designed that the two smaller end sections are able to lift the larger center section to a sufficient height above the water to permit the operations of painting, cleaning, repairs, etc., while the center pontoon is of sufficient capacity to dock the two end sections simultaneously on its deck blocking. The middle pontoon has the side walls projecting over and securely fastened to the main deck of the end pontoons, while these sections have independent side walls outside and parallel to the overhanging side walls of the middle pontoon. The side walls of the end pontoons are provided for the purpose of affording stability in self docking operations. The general arrangement will easily be under-

stood from an inspection of the accompanying drawings.

The total length of the dock is 500 ft., made up by the center section of the center pontoon, which is 316 ft. long, two end sections, that have a total length, each, of 90 ft., and 2 ft. open space at each pontoon connection. The depth of pontoon is 18 ft. 6 in. throughout the dock and breadth of center section is 134 ft. over all. Free space from fender to fender of painting stage is 100 ft., while total width between side walls is 106 ft. The pontoons of end sections have the same width as the center section, but total width of these sections measured over side walls is 156 ft., while free space between them is 139 ft. The total height of dock structure is about 63 ft. 8 in., while the depth of side walls measured to main deck is 45 ft. 2 in. The side walls of end pontoons are 20 ft. high above main deck, which with the depth of pontoon gives a total height of 38 ft. 6 in.

The dock is longitudinally divided into six water-tight compartments by five bulkheads, which are located one in the center of the dock called the central longitudinal bulkhead, one on each side of and 22 ft. from central longitudinal called the port and starboard intermediate longitudinal bulkhead, and one under each side wall, forming a continuation of the inboard side wall plating. These compartments are, however, sub-divided in bays by transverse bulkheads spaced 8 ft. on centers. There are five water-tight transverse bulkheads in the center pontoon and two in each end pontoon, all others being non-watertight, with large man and limber-holes to permit the passage of water.

With 2 ft. freeboard the dock will have a lifting capacity of 18,500 gross tons, and will consequently be able to lift any of the large ships of the United States Navy.

The hull is made of open-hearth steel, with a maximum tensile strength of 55,000 to 65,000 lbs. per sq. in., an elastic limit of not less than one-half the maximum tensile strength, and an elongation of not less than 23 per cent. in 8 in.

The dock is a frame structure with frames in pontoon between side walls running longitudinally between transverse watertight and non-watertight plate bulkheads, placed 8 ft. center to center. Frames in side walls are placed transversely. The frame spacing is 2 ft. throughout the dock.

In the longitudinal frames, the vertical and bottom members generally consist of 6-in. x 3½-in. x $^{7}/_{16}$-in. angles, while the top members are of 15-in. x 33-lb. channels on the central frames, and 12-in. x 25-lb. channels on the five frames nearest to the side walls. These members are connected in the corners by plate gussets and diagonal braces, the latter consisting of 4½-in. x 3-in. x $^{7}/_{16}$-in. angle bars. The frames in the side walls are built in the same manner, but are stiffened at certain intervals of horizontal struts. The total height of frames in side walls is about 47 ft. 1 in. Above the engine deck, the vertical members of frames are composed of 6-in. channels, connected to engine deck by means of gussets and lugs, and top members of 6-in. x 3½-in. x $^{7}/_{16}$-in. angles, secured at the corners in the same manner as the other described frames.

The transverse bulkheads are composed of vertical plates $^{7}/_{16}$-in. thick attached to deck and bottom plating by double angle bars running across the pontoon with single bars at the side walls.

The central longitudinal bulkhead is built of vertical $^{7}/_{16}$-in. plates, intercostal between the transverse bulkheads and connected to deck and bottom of pontoon by double angle bars with one of them joggled over the transverse bulkhead angles. The bulkhead is stiffened by a $^{7}/_{16}$-in. breathing plate, extending on each side over the two first frames, and by lugs connected to deck and bottom plating. It is furthermore stiffened by double 6-in. x 3½-in. x $^{7}/_{16}$-in angles placed on each side of the plating and about 2 ft. fore and aft of the breathing plate.

The intermediate longitudinal bulkheads are built of the same size of plating as the central, but stiffened by 7-in. x 14-in., 75-lb. channels placed about 2 ft. apart.

All the plating throughout the dock is laid to cross the frames at right angles. The bottom plating is therefore transverse between sidewalls and longitudinal under the sidewalls. Bottom plating $^{19}/_{32}$ in. thick throughout except under the sidewalls in the center pontoon, where $^{9}/_{16}$-in. plating has been used. .The middle strakes of side wall plating are ½ in., and thickness towards bottom is increased to $^{9}/_{16}$ in. and towards top to ⅝ in., which in the center of the dock has been doubled at the two upper strakes to obtain increased stiffness. The engine deck is connected to the top of the side wall frames and designed throughout the dock to have ½-in. plating. To give required stiffness the top deck is built of ⅝-in. plating, which is doubled in the center part of the dock. The main deck is $^{19}/_{32}$-in. throughout with seams and butts flush in the same manner as top deck and plating placed transversely. Both top and main deck have countersunk rivets. End plating is generally $^{19}/_{32}$-in.

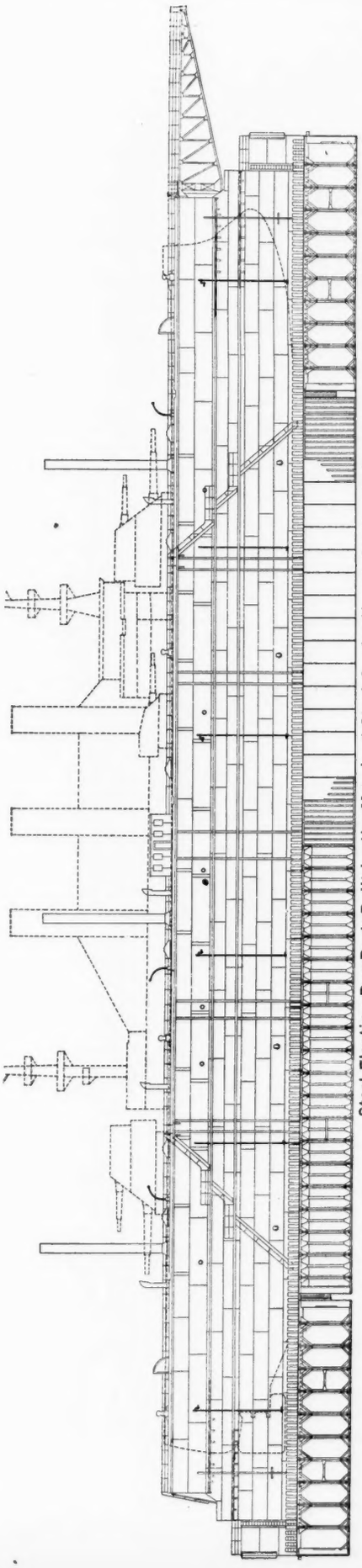
Each end pontoon is connected to the center pontoon by horizontal and vertical joints, of which the first mentioned are formed by the side wall plating and angles riveted thereto and connection made by 1½-in. bolts spaced about 9 in. apart. The vertical joints are formed by extending the five longitudinal bulkheads and outboard side wall plating, making altogether seven joints, fitted with 6-in. x 6-in. x 1-in. angle bars, connection being made by 2-in. bolts with a pitch of 6 in.

In the design and laying out of the machinery the aim has been to simplify and centralize everything possible. Thus the main pumping machinery and operating gear for the valves in the branch-off pipes to the different compartments have been placed in the port side wall, where everything is in easy communication with the operator in charge, while the auxiliary machinery, quarters for officers and crew have been located on the starboard side.

The main drain consists of cast-iron pipes, located on the port side, having 24-in. inside diameter at the center and reduced towards the ends down to 14 in. From the main line branches leading to the different watertight compartments, with their operating valves, are located in the port side wall. Means are even provided by five flushing valves to flood the dock through the main drain pipes. The above mentioned operating valves are of the solid wedge-gate type and the gear is so arranged that the whole system can be easily operated from one operating house, located in the center of the dock on top of the port side wall. The valve gear is controlled by a system of horizontal shafts and levers connected to quadrants located in the operating house. As the different pontoons have to be operated independent of each other in self-docking, facilities have been provided for disconnecting gear, and each end pontoon has its valve gear worked freely from its own engine room.

Cross Section of Cavite Dock.

The pumps are located on the main pipe line as low down as possible. They are of the general centrifugal type with horizontal discharge and vertical axis. There are three 24-in. pumps and two 12-in., the latter used only for self-docking purposes and placed in the extreme ends of the end pontoons Each of the 24-in. pumps is driven by a horizontal, direct-connected, compound engine, 14½-in. x 25-in. x 14-in., with cylinders placed at an angle of 135 deg. With a steam pressure of 140 lbs. per sq. in. and 225 r.p.m., this engine develops about 225 i.h.p. The 12-in. pumps are driven by single cylinder engines 12 in. x 10 in., direct-connected to pumpshaft. Steam is generated for the main engines in three Babcock & Wilcox boilers, marine type, with a grate surface each of about 46 sq. ft., and a heating surface of 1,750 sq. ft. Each boiler is furnished with its own feed pump of the



Steel Floating Dry Dock Built by the Maryland Steel Co. for Use at Cavite, P. I.

usual, vertical, single cylinder type, 6-in. x 4-in. x 8-in., taking water from fresh water tanks located on the starboard side. The feed water passes through a feed water heater, worked by the exhaust steam from the main engines, before entering the boiler. A Rand drill air compressor is also located on this side of sufficient size and capacity to operate pneumatic tools, necessary in the repairs of ships. In both side walls a ventilating system is installed, driven by a 4-in. x 4-in. vertical engine of the Sturtevant make, supplying fresh air in all the various working rooms and quarters.

The auxiliary machinery is installed in the starboard side wall, and a donkey boiler of same type as the main boilers supplies all the steam necessary. This boiler has a grate surface of about 18 sq. ft. and a heating surface of 750 sq. ft. A 7-k.w. Sturtevant 110-volt generator, driven by a single cylinder, direct-connected engine 6 in. x 6 in., supplies current for electric lamps, distributed in the quarters and the different working compartments. A distilling apparatus with a capacity of 2,500 gallons a day is also installed in the engine room on this side.

In the forward overhanging part of starboard side wall, a small machine shop is located, furnished with the following equipment: Eighteen-ft. 16-in. swing lathe, pipe cutter with capacity for pipes from 1-in. to 4-in., 25-in. power drill, shaper, emery wheel, bench, etc., for the performance of minor repairs on ships taken into the dock. All the machinery in the shop is driven by a single cylinder, vertical engine, 6 in. x 6 in., developing about 15 i.h.p.

On the top deck are placed eight Hyde capstans, used for self-docking and hauling in ships, together with necessary chocks, cleats and valve stands for operating the flushing valves and valves in main drain, etc.

To provide easy communication between side walls a pair of swinging cantilevers project from the forward end of side walls, and provision has been made for using same as cranes for smaller weights.

The blocking consists of a row of 5-ft. blocks placed transversely and spaced 2 ft. center to center over the whole length on the center or keel line. On each side of the center bilge blocks are located for about 280 ft., and every third sill is fitted with a sliding block of the usual navy type.

It will be seen from this brief description that both in the construction of the hull and fitting out of the machinery and equipment, the requirements have been well met in making the Cavite floating dry dock suitable for its service in the distant Philippine waters.

Safety Appliances and the Federal Law.*

Since the last convention a great forward step has been taken in the matter of safety appliance, and I believe it is not too much to say that the Master Car Builders' standards and rules, so far as they affect the interchange of cars, are better observed to-day than ever before.

The Johnson case was decided by the Supreme Court of the United States in December last. This decision fully sustained the contention of the Government and firmly established the status of the law in all of its essential features. It is now a settled rule of law that, for the protection of their employees, railroad companies are required to equip their cars with couplers that can be both coupled and uncoupled without the necessity for men to go between the cars, and to maintain such couplers in an operative condition. As stated by Chief Justice Fuller, who wrote the opinion in the Johnson case, "the object was to protect the lives and limbs of railroad employees by rendering it unnecessary for a man operating the couplers to go between the ends of the cars." That is the real test of compliance with the law.

Following the Johnson decision came the decision of Judge Humphrey, of the Southern District of Illinois, in the case of the United States vs. the Southern Railway. This decision further fortified the law by the declaration that to use a car at all when its safety appliances are in such a defective condition as to compel men to go between the cars is in itself a disregard of law. It was also decided that reasonable care or due diligence to keep equipment in order is no defense to an action brought to recover the penalty prescribed by law; also that the use of an M. C. B. defect card to cover defects to safety appliances does not relieve a carrier from responsibility for accepting a car in a defective condition from one of its connections.

There were a number of cases that hinged upon this decision, and it was at one time stated that the railroads contemplated an appeal, but after thoroughly investigating the subject this idea was abandoned (if it had ever been entertained), and all the roads involved have paid the statutory penalty for violation. The law has, therefore, met the most sanguine hopes of its friends, and with a President and Attorney-General both determined to see that it is enforced to the letter, the efforts of the Commission to perform the duty imposed upon it, with the earnest co-operation of many railroad managers and members of your association, have resulted in a vastly better condition of equipment the country over.

For the six months ending Dec. 31, 1904, reports covering two of the largest systems in the country show that of the cars inspected 38 per cent. and 21 per cent. respectively, were found to be defective, while for the period from Jan. 1, 1905, to date, the defective cars found were but 8 per cent. and 2 per cent. respectively, on approximately an equal number of cars. This is a very gratifying result, the more so as it is an indication of a general improvement that has taken place in the past six months, and I have no doubt that the result of this improvement will make itself manifest in a vastly decreased number of casualties to employees when our accident statistics for the year make their appearance.

One question that has been brought to a head is the acceptance of defective cars in interchange, with the understanding that the receiving road will repair them. This has been the rule in many places, as you are aware, but since the Johnson and Humphrey decisions have been rendered it is rapidly being done away with so far as safety appliances are concerned. The rule now coming to be most commonly observed is that no road will receive cars in interchange unless all safety appliances are in perfect order. This is the only practicable method whereby receiving roads may protect themselves from the consequences of violation of the law, and the Commission has exerted its influence to secure general adoption of the rule. In some cases this rule has entailed hardship, as it has led to the detention of live stock and perishable freight, and has necessitated the hauling of defective cars for considerable distances in order that they might be repaired; but such results were only to be expected as a consequence of the changed condition. The natural result is bound to be that each road will pay proper attention to its own repairs instead of passing the burden on to its connections, and the number of defective cars at interchange points will be reduced to the minimum. It

*An address before the Master Car Builders' Association, by Edward A. Moseley, Secretary of the Interstate Commerce Commission.

is confidently predicted that before a year is over a railroad will no more think of accepting a freight car that is out of order than it would think of accepting a passenger car in improper condition. And this is as it should be. It lessens the number of accidents, reduces the number of damage suits, and leads to rigid inspection and an ideal condition of equipment.

The Commission has repeatedly been requested to interpret the law in certain particulars, and has been asked whether this thing or that thing can be permitted, or whether this device or that device can be used. Such questions are idle, as the Commission can give but one answer to them, and that is to furnish copies of the law and the decisions of the courts interpreting it. Interested parties should familiarize themselves with the state of the law, and decide for themselves what is and what is not a violation. If in doubt on any point they should ask the legal department of their road for a ruling, and not the Commission. On the Commission is imposed the duty of seeing that the law is enforced, and it is entirely out of place to ask an officer charged with the enforcement of a law whether in some particular instance he intends to perform his duty or not. If an accident happens to cars in transit; if a sudden jerk breaks an uncoupling chain or pulls out a drawbar, the best answer as to what the Commission would do about enforcing the law under such conditions is for one to apply the rules of ordinary common sense. The law does not require impossibilities, nor does it aim to impose burdens that cannot be met; and even a Government inspector or prosecuting officer must be given credit for the possession of ordinary judgment.

It is most gratifying to be able to state that in most instances railroad officials have heartily co-operated with the Commission in its efforts to secure compliance with the law, and I embrace this opportunity to extend the thanks of the Commission to the members of your association who have so faithfully and earnestly labored in harmony with the Commission, in the face of many difficulties, to bring about the pleasing results that now obtain. The Commission's rules of inspection, which are based upon your standards and recommended practice as well as the law, are being generally accepted and recognized as the criterion of proper conditions. When this becomes fully the rule of action the necessity for prosecutions, or for further legislation covering these matters will be entirely done away with. As I have before stated, I hope to see the time when the standards and recommended practices of your association shall be the law of the land, and I think you will agree with me that events of the past few months have given your standards and practices a quasi-legal standing, in so far as they are covered by the rules of the Commission.

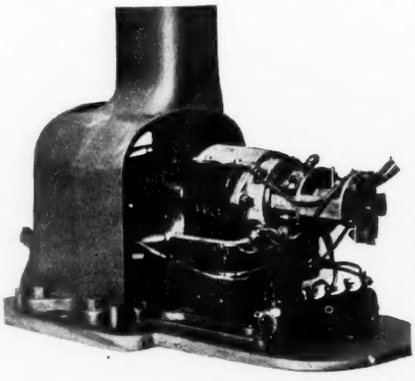
I desire to call your attention, with special approval, to the various orders and rules that have been recently issued by carriers with regard to the acceptance of foreign cars in interchange, and methods of inspection; and particularly do I wish to commend the circular of instructions issued by the Baltimore & Ohio Railroad. These rules foreshadow the ideal condition of equipment which the members of your association and the Commission have so long hoped and worked for.

I have no doubt that the pleasant relations that have always existed between the Master Car Builders and the Commission and its corps of inspectors will be maintained in the future. We have sought to impress our inspectors with the idea that the Master Car Builders and ourselves are working to a common end, and have insisted that they shall be familiar with your rules and standards, such familiarity, in fact, being one of the prerequisites of appointment to the position of inspector. For our inspectors and myself I desire to thank you for the uniform courtesy and good-will manifested towards us. . . .

Motor-Driven Dwarf Signal.

The dwarf signal being used by the Union Switch & Signal Company in connection with its new system of all-electric interlocking, is worked by an electric motor similar to that used in connection with the high signals. The motor is geared to and drives, by means of a worm gear, a horizontal shaft to which the armature of an electro-magnetic clutch is fixed. The other part of the clutch, enclosing the exciting coil, is fitted loosely on the shaft. This loose part of the clutch has a crank pin affixed, to which the operating rod of the signal is attached. When the signal is in the normal or stop position the crank pin is vertically under the shaft; when clear the crank pin is about 45 deg. above the horizontal.

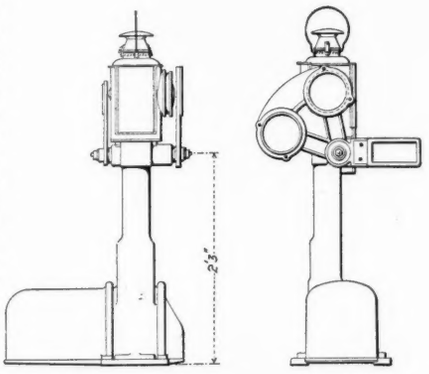
The exciting coil of the clutch is connected in series with the motor, and when the operating current is switched on, both the motor and clutch are excited; the first causing the clutch armature to rotate, and the second causing the loose part of the clutch to adhere to the armature and move with it. When the signal reaches the clear position a circuit switch cuts in sufficient resistance to reduce the holding-clear current to a very small amount and stops the motor.



Electric Motor for Dwarf Semaphore.

The signal is locked in the normal position by means of a hook-shaped formation on the eye of the operating rod, which engages with the shaft carrying the clutch, whenever the rod is moved upward a very short distance. Sufficient lost motion is allowed in the crank pin hole to permit a slight upward movement of the rod without turning the clutch.

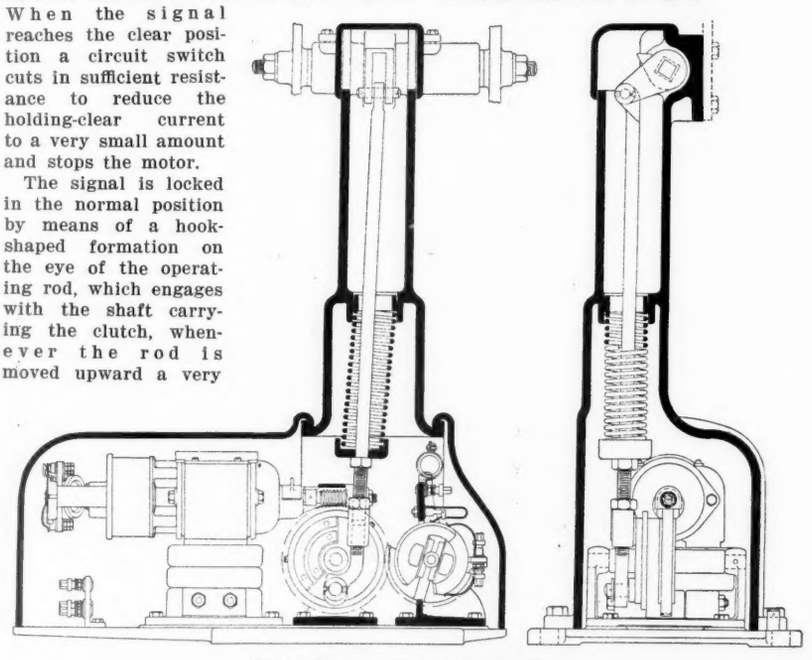
The amount of current required to work this signal is very small, not more than 1¼ amperes, while that required to move the arm of the solenoid dwarf signal, heretofore extensively used, is from three to five amperes. While the saving in current consumption may not be a matter of great importance, since the time during which the signal is being cleared is a very small fraction of the whole time, yet the reduction in size of operating wires permissible with the motor-driven signal will materially lessen the cost of installation and maintenance.



New Union Dwarf Signal.

This method of operating the dwarf signal permits the use of the same kind of current for actuating the indication mechanism as is used in connection with the high signal; that is, the battery current transformed into an alternating current; and thus frees it from the dangers of false indications to which the solenoid type of signal is subject. The construction of the high and dwarf signal levers, including the indication mechanism, is also made uniform.

This signal was first brought to public notice at the Railway Appliance Exhibit of the International Railway Congress, Washington, D. C., where it elicited much favorable comment from railroad men.



Motor-Driven Dwarf Semaphore.

The Andrew Automatic Ventilator.

The Safety Car Heating & Lighting Company has arranged for the sale and manufacture of the Andrew car ventilator, to meet the demand for a positive ventilating device on passenger cars. The Andrew

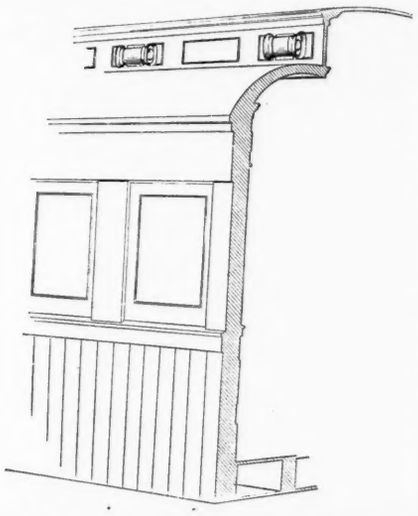


Fig. 1—Ventilators Applied to Car.

ventilator has been applied on a number of cars now in service and is giving most satisfactory results.

The ventilator, which is designed for application to a portion of the deck sash openings of a car, is of the exhaust type. It operates on the ejector principle, and is automatically reversible, accommodating itself in operation to the direction of the movement of the train without attention. Fig. 1 shows in elevation its application to the side deck

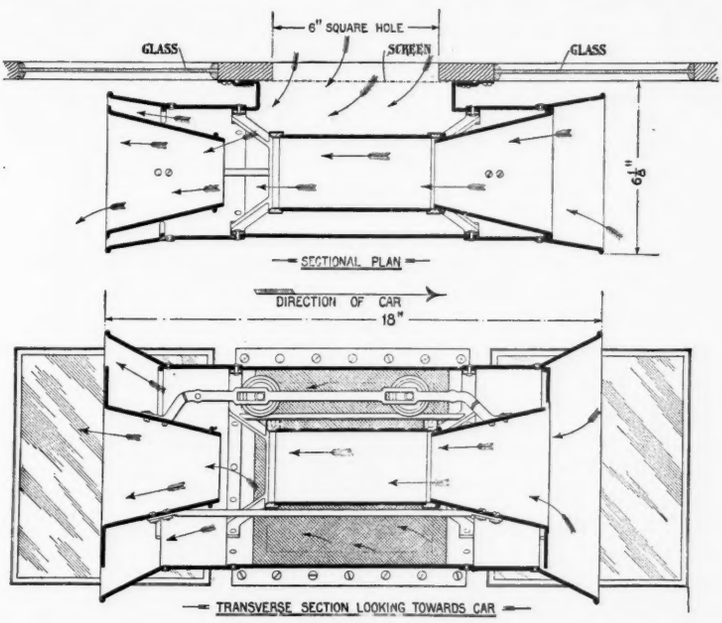


Fig. 2—Details of Andrew Automatic Ventilator.

of a car. It is shown in sectional elevation and section plan in Fig. 2. It is applied in connection with the deck sash openings, the screen being removed and a frame for the ventilator being substituted, provided with glass, except for the screened opening 6 in. square for the ventilator connection. The ventilators communicate directly with the interior of the car when the deck sash is open. The deck sashes and their openings which are not fitted with ventilators need no alteration or attention; they may be opened for air supply or left closed.

It will be seen that the ventilator is stormproof against transverse storms and that rain, snow, smoke and cinders striking it longitudinally are carried through the ventilator beyond the opening connecting with the car. The reversal of the ventilator with a change in the direction of movement of the train is accomplished automatically at any speed above four miles an hour, the deflecting aprons being so mounted that only a small force is needed to overcome the rolling friction of their bearings. Their operation is noiseless.

It is not necessary or desirable to apply ventilators to all deck sash openings. For an ordinary passenger coach, one over each toilet room, and eight connected to the deck sash openings of the main body of the car are sufficient. For Pullman cars, one over each toilet room, two over small smoking-rooms, and four over large smoking-rooms, two for each compartment and four for the main body of a 12-section sleeper, are sufficient. Tests show that the average amount of air exhausted by each ventilator at varying speeds is 24 cu. ft. a minute or 1,440 cu. ft. an hour, and at that rate, four of these ventilators applied to a large smoking room, say 6 ft. wide and 8 ft. long, will effect a complete change of the air in the room every five minutes.

Testimonial to Messrs. Post, Moore and Brown.

As a testimonial of the appreciation of the supply men to Chairman Post, for his efficient services in managing the American Railway Appliance Exhibition at Washington, and of Mr. J. Alexander Brown, Secretary and Director of the exhibits, Mr. Post and Mr. Brown were each presented with a chest of silver at the Manhattan Beach convention. Mr. Charles A. Moore, Treasurer of the exhibition, was also presented with a large silver vase. At noon, June 19, the General Committee of Arrangements of the Appliance Exhibition met at the Oriental Hotel and received the reports of the officers. The management had been so efficient that there was a balance of approximately $8,500 after paying all expenses, in place of the deficit which is always to be expected from expositions, large or small. At the conclusion of the business meeting, Mr. E. B. Leigh, member of a sub-committee appointed at Washington, the other members of which were Otis H. Cutler, H. H. Westinghouse, L. F. Braine and Albert Waycott, made the speech of presentation. The members of this sub-committee on their own account also presented Mr. Post and Mr. Brown each with a Tiffany repeater watch, suitably engraved. Both Mr. Leigh and Mr. Cutler spoke in the highest terms of the way in which the exhibition at Washington was managed. Mr. Leigh said that the secret of the success of the exhibition rested in generosity, fidelity and efficiency as these qualities were displayed by Messrs. Post, Moore and Brown.

Railroad Legislation in the State of Washington.

Railroads and railroad legislation dominated the recent session of the legislature of Washington, and the election of a United States Senator was of secondary importance.

The Cascade mountains divide the State of Washington into two distinct parts, of dissimilar climate and widely diverted industries. In the eastern section of the state, great wheat and cattle and fruit ranches are to be found. Of the wheat district, Walla Walla is the center. Yet Spokane, a city with a population of 65,000, in the northeastern part of the state, is the supply station of a vast mining and agricultural region. On the west side lumber and fishing furnish the means of living. Yet here are the two great seaports of Tacoma and Seattle. To this seaboard comes the grain of the east side. But eastern and western Washington do not live in harmony. Because of their location at tide water Tacoma and Seattle enjoy through rates. There has been a time when the merchants of these two cities could afford to reship goods bought in the east back across the Cascades to the farmers of the east side. Spokane made a fuss and Tacoma and Seattle merchants combined to resist what they considered the encroachments of the Spokane men. Two years ago the farmers made a railroad commission the issue. But the west side was indifferent and the legislature enacted no rate legislation.

Last year Governor McBride again made the commission idea the chief issue. On it he made a campaign for the gubernatorial nomination. The fight was bitter and he lost. The Republican convention named Albert E. Mead and refused to insert a commission plank in the platform. Yet the commission ghost would not be laid. Mead made a tour of the state. In eastern Washington he saw the tide setting against him. In his efforts to stay it he promised that, if elected, he would sign any commission bill the legislature might pass. On the crest of the Roosevelt wave Mead rode into the Governor's chair. The legislature was overwhelmingly Republican, 128 of the 136 members being of the dominant party. On the issue, though, of railroad legislation, the body was divided as sharply as if party lines had been tightly drawn. The west side opposed the commission; the eastern delegates just as strongly favored it.

Five commission bills were presented the first day of the session. Each was called drastic; each found ardent friends and bitter enemies. A joint railroad committee

was named and it undertook the task of drafting an equitable bill. At its first meeting the entire matter was argued. The railroads were represented by C. M. Levey, then assistant to the President of the Northern Pacific, and by W. W. Cotton, General Counsel for the Oregon Railroad & Navigation Company. Harry Fairchild, a lawyer, politician and close personal friend of Governor Mead, and now chairman of the commission, appeared for the shippers and the advocates of the commission. After much caucussing and log rolling the lumbermen at last combined with the east side Senators and passed a railroad commission bill. It became a law June 1. The Governor has appointed one commissioner, Fairchild.

The essential provisions of the bill are: (1) The appointment for terms of six years of three commissioners; the commission to sit as a board of arbitration or inquiry—as the first when complaint of an unjust or discriminatory rate is made, the second when it investigates a rate on its own motion or initiative. (2) The commission will have power to change or alter a rate when it roads, dissenting, may appeal to the Superior Court of Thurston County, and the case takes precedence of any on the calendar. (3) The commission has authority through the courts to enforce its own orders. (4) The commission may make joint rates, when the railroads fail to agree. (5) The commission may summon any railroad official or employee as a witness and may compel the attendance of witnesses. (6) The commission has the right to call for the records and the books of a railroad. (7) Every railroad is expressly prohibited from charging more for a shorter than a longer haul over the same line and in the same direction, when the shorter is included within the longer distance. (8) The salary of a commissioner is $4,000 a year. Passes are prohibited (and the Northern Pacific has recalled all it has issued in Washington).

Another bill fixes the maximum passenger fare at 3 cents a mile. The usual penalties for a violation of the law are prescribed. After persistent work and at last through a combination with the commission advocates, the following bills were passed and have since become laws: (1) An act requiring railroad companies to weigh at junction or common points cars loaded with lumber, shingles and other forest products. (2) An act requiring railroads to include in the weight of cars used for the shipment of lumber and manufactured lumber products the weight of the standards, supports, strips, railings and other devices employed in the safe carrying of lumber and allowing 1,000 lbs., to be included with the weight of the car, for this purpose. (3) A bill to prevent scalping and fixing the penalty at a fine of not less than $100 nor more than $500. (6) A bill giving logging roads the right of eminent domain; and (7) a state tax commission bill. The powers given by this tax commission measure are limited.

Another bill not specifically of a railroad character, but which is interesting because of the bearing it might have on a merger such as that of the Northern Securities Company, is one giving any corporation the right to buy, sell and vote stock in any other corporation.

It is freely predicted that most, if not all, of these bills will be repealed when the legislature sits again.

The four-wheeled passenger car seems to be out of favor in Prussia. In a recent large order the specifications called for 14 four-wheeled, 388 six-wheeled, and 263 eight-wheeled cars. Of the six-wheeled cars 158 were fourth-class. For long runs eight-wheeled cars prevail more and more.

Additional Exhibits at Manhattan Beach.

The following list of exhibits at the Manhattan Beach conventions completes the partial list printed last week, p. 713:

Acme Railway Equipment Co., Easton, Pa.—Uncoupling device.

Adreon & Co., St. Louis, Mo.—"Perfecto" drifting valve and "Perfecto" blow-off valve.

American Balance Valve Co., Jersey Shore, Pa.—High pressure slide valves, internal and external admission; low cylinder clearance valve; American semi-plug piston valve after 2 years and 9 months' service, also model of double and triple end piston valves.

American Corundum Co., New York.—Corundum wheels, also samples of ore.

American Locomotive Appliance Co., Washington, D. C.—Draft regulator for locomotives.

Andrews, J. S., & Co., New York.—Andrews solid cast-steel truck frame.

Anglo-American Varnish Co., Newark, N. J.—Varnishes.

Bender Car Door Co., Kansas City, Miss.—Model of car showing the application of the Bender steel grain door with loading and unloading platform; also combined grain and car door.

Besley, Chas. H., & Co., Chicago.—Spiral-grooved steel grinding disks; heavy spiral cloth and paper circles; Helmet temper tops for threading nuts; Helmet-Babbit for bearings and Helmet oil.

Boker & Co., Hermann, New York.—"Novo" steel tools and cutters.

Bordo, L. J., Company, Philadelphia, Pa.—Blow-off valves, hydraulic valves and swing joints for locomotive and tender connections.

Boston Belting Company, Boston, Mass.—Air-brake hose and other rubber goods for railroad use.

Bowser, S. F., & Co., Fort Wayne, Ind.—Oil house equipment for railroads and factories, also slop tanks, cabinets, etc.

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.—Motor driven grinding machines; also emery and corundum wheels.

Browning Engineering Company, Cleveland, Ohio.—Photographs, blue prints and bulletins of locomotive cranes, clam-shell buckets; and hoisting and conveying machinery.

Butler Draw Attachment Co., Cleveland, Ohio.—Butler draw-bar attachments.

Camel Co., Chicago.—Car door fixtures, Camel journal bearings and Hartman ball-bearing center plates and side bearings.

Chicago Railway Equipment Co., Chicago.—The "Monitor" car bolster.

Cleveland Car Specialty Co., Cleveland, Ohio.—Pressed steel carlines; also track exhibit of box-car fitted with pressed steel carlines.

Cleveland City Forge & Iron Co., Cleveland, Ohio.—Turnbuckles, drawbar yokes and a general line of car forgings.

Cling-Surface Co., Buffalo, N. Y.—Device for demonstrating the difference in efficiency between a belt treated with "Cling-Surface" and running slack as compared to a belt untreated running tight.

Coe, W. H., Manufacturing Co., Providence, R. I.—Coe's gilding wheels and ribbon gold leaf.

Crandall Packing Co., Palmyra, N. Y.—Crandall packing for air pumps, throttle valves, etc.

Davis Expansion Boring Tool Co., St. Louis, Mo.—The Davis expansion boring tool for care wheels.

Detroit Graphite Mfg. Co., Detroit, Mich.—Samples of paints for steel cars, etc.

Detroit Seamless Steel Tubes Co., Detroit, Mich.—Seamless steel locomotive flues also samples of material showing the process of manufacture from the billet to the finished tube.

Diamond Machine Co., Providence, R. I.—One wood and two metal Gorton disc grinding machines in operation; also spiral and plain grinding discs.

Dixon Crucible Co., Joseph, Jersey City, N. J.—Dixon silicate graphite paint and Dixon's graphite lubricants.

The Duner Company, Chicago.—The usual complete exhibit of the Duner devices was supplemented by the presence of the private car "El Fleda," which was equipped with the Duner devices as supplied in regular service.

Eaton, Cole & Burnham Co., Bridgeport, Conn.—Valves and fittings, pipe machines and fitters' tools, steel castings and steel valves.

Federal Mfg. Co., Chicago, Ill.—Water closets for railroad cars and stations.

General Electric Company, New York.—Curtis' steam turbine; combination automatic and straight air-brake compressor; mercury arc rectifier, etc.

Goldschmidt Thermit Co., New York.—Demonstrations of welding steel by the Goldschmidt process.

Good Door Retainer Co., The, Philadelphia, Pa.—The Good door retainer.

Handlan-Buck Mfg. Co., St. Louis, Mo.—Full line of railway supplies, including coach markers.

Hanlon Locomotive Sander Co., Winchester, Mass.—The Hanlon pneumatic locomotive sander in operation.

Harrison Dust Guard Co., Toledo, Ohio.—Harrison dust guards.

Harrison-Williams Co., Toledo, Ohio.—Harrison automatic car journal lubricator.

Helwig Mfg. Co., St. Paul, Minn.—Pneumatic tools including the Helwig pneumatic hammer, which is cushioned in the handle to prevent jarring.

Home Rubber Co., Trenton, N. J.—Samples of N. B. O. sheet packing and sectional tubular gaskets; also air brakes and steam hose.

Hummel, Chas. C., Espy, Pa.—The Hummel convertible coach step, operated by compressed air.

Indestructible Fibre Company, New York.—Samples of car headlinings, fibre boards, etc.

Jones Car Door Company, Chicago.—Jones car door, Smith car door and Brown car door.

Kennicott Water Softener Co., Chicago.—Map showing location of the company's apparatus on the various railroads of this country.

King Automatic Platform Closure Co., New York.—Model of passenger car showing application of the King automatic platform trap door; also the feasible drop-brake shaft as applied to flat cars.

Lawrence, V. O., & Co., Philadelphia, Pa.—Working model of the Filion patent diagonal folding vestibule trap door. This trap is also shown on the Long Island R. R. standard car on track.

Lever Suspension Brake Co., Boston, Mass.—Model showing application of the lever suspension brake system.

Lewis, James, Montrose, W. Va.—The Lewis Turn-down car stakes.

Magnolia Metal Co., New York.—Babbit metals.

Major, A., New York.—Major's compartment water coolers for railroad use.

Mann-McCann Co., Chicago.—Northwestern sander in operation, and the Ravlin electric wiring system.

Martin Car Heating Co., Dunkirk, N. Y.—Couplers, valves, steam traps and other steam specialties.

Moran Flexible Joint Co., Louisville, Ky.—Metallic flexible joints.

Morse, Williams & Co., Philadelphia, Pa.—Photographs of elevators for locomotive shop use.

Nathan Mfg. Co., New York.—The "Freedman" force feed lubricating pump.

National Railroad Supply Co., Denver, Colo.—The Dunn automatic coupler.

Newton Fire Brick Co., Albany, N. Y.—Locomotive fire bricks.

Nichols, Geo. P., & Bro., Chicago.—Illuminated transparencies of electric transfer tables and draw-bridge machinery.

Norton, A. O., Boston, Mass.—Norton ball-bearing lifting jacks, also style "K" journal jack, fitted with automatic stop.

Otley Mfg. Co., Chicago.—Eureka cement for steam joints, also enamel for front ends and smoke-jacks.

Page Car Company, Boston, Mass.—Track exhibit of the Page dump car.

Patton Paint Co., Milwaukee, Wis.—A specially designed advertising device painted with Patton's paints.

Pedrick & Ayer Co., Plainfield, N. J.—Boring bars, portable valve facing machine, air hoists, pneumatic punch, planer tool for curved surfaces, radius link planer attachment, portable pneumatic engine, and eye-beam trolleys.

Pike Mfg. Co., Littleton, N. H., and New York.—All sizes and shapes of corundum and emery wheels, etc.

Pitt Car Gate Co., New York.—Gibbs door operating device as used on the Subway; the Pitt elevated railway gate; Pitt balance door for stations, and the "Reliance" ball-bearing door hanger.

Pittsburg Spring & Steel Co., Pittsburg, Pa.—Tender springs, engine and truck springs, elliptic and equalizer coach springs, M. C. B. standard bolster springs, for 30, 40 and 50-ton cars; M. C. B. standard draft springs, valve springs, brake release and governor springs.

Post, E. L., & Co., New York.—Sample of Post's zero metal for journal bearings.

Quaker City Rubber Co., Philadelphia, Pa.—Danials "P. P. P." packing, ebonite sheet packing, air brake hose and mechanical rubber goods.

Railway Appliance Co., Chicago.—Oldsmobile inspection car, Bonzano rail-joint, and Q. & C. anti-creepers.

Rand Drill Co., New York.—Pneumatic tools, including drills, hammers, motor hoists, etc.

Robbins Conveying Belt Co., New York.—Working model of 16-in. conveyor.

Rushmore Dynamo Works, Plainfield, N. J.—The Rushmore lens mirror searchlight for locomotive headlights and automobiles.

Russell, Burdsall & Ward Bolt & Nut Company, Port Chester, New York.—Nuts and bolts for railroad use.

Scientific American Compiling Co., New York.—The Encyclopedia Americana.

Spiral Nut Lock Co., New York.—Spiral nut locks.

Standard Car Truck Co., Chicago.—Models of Barber car and locomotive trucks.

Star Asbestos Mfg. Co., New York.—Asbestos packing and cable wrapping.

Saint Louis Car Co., St. Louis, Mo.—Spiral journal bearings.

Starrett, L. S., & Co., Athol, Mass.—Full line of mechanical instruments, also hack saws.

Stiles Metal Co., New Haven, Conn.—Journal bearings and Babbitt metals.

Templeton, Kenly & Co., Chicago.—Simplex car jacks of 10 and 15 tons capacity.

Trojan Car Coupler Co., New York.—The Junior Coupler.

Tyler Tube & Pipe Co., New York.—Knobbled charcoal iron bloom, boiler tubes, showing sections as tested for beading, flanging, expanding and flattening both horizontally and longitudinally.

United States Lighting and Heating Co., New York.—Four-wheel truck fitted with electric generator, regulator and storage batteries.

Vacuum Cleaner Co., New York.—Car cleaning by the vacuum system.

Walworth Mfg. Co., Boston, Mass.—Walworth locomotive injectors, die plates and pipe cutters, taps and dies, Miller ratchet die plates, vises, Smith friction track drill, and Smith sleeve and boiler ratchet drill.

Washburn Co., Minneapolis, Minn.—Washburn freight car, locomotive pilot, and passenger car couplers.

Westinghouse Electric & Mfg. Co., Pittsburg, Pa.—Electric motors.

Williams, J. H., & Co., New York.—Samples of drop forgings for railroad use, wrenches, etc.

Wellman Air Valve Co., Toledo, Ohio.—The Wellman automatic air valve for train pipe connections.

Woods Machine Co., S. A., Boston, Mass.—Chain mortising machine, also knife grinder.

GENERAL NEWS SECTION

NOTES.

The State Railroad Commission of Indiana has called upon the railroads for lists of persons to whom passes are issued.

The Legislature of Florida has passed a law requiring separation of white from colored passengers in street cars. It goes into effect July 1.

The discipline report of the Eastern division of the Wabash for the month of May shows two employees dismissed, 21 charged with demerits and 17 credited with merits.

Hardware dealers of Savannah have secured an injunction to restrain the Railroad Commission of Georgia from changing certain freight rates, the proposed change being to the advantage, they claim, of Atlanta, and to the detriment of other cities.

About 5,000 employees of the Pennsylvania Railroad on the Pittsburg division were paid their last month's wages in cash. Heretofore these payments have been made by check throughout the company's lines, but there is some objection to this method.

The Interstate Commerce Commission has filed a complaint in the United States Court at New Orleans to compel compliance by the railroads with its order reducing by two cents per 100 lbs. the rates on lumber from the southeastern states to Ohio river points, The first hearing will be July 17.

Twenty railroad companies in Missouri propose to apply to the United States Court for an injunction against the enforcement of the law recently passed in that state empowering the Railroad Commission to fix maximum rates. According to the terms of this law, it was to go into effect June 16.

The Government has commenced suit in the United States court at Trenton, N. J., against the Lehigh Valley for the recovery of the statutory penalty of $100 for four violations of the Safety Appliance law. The offence was running of locomotives not equipped with automatic coupler and handholds.

It is reported at Boston that the New York, New Haven & Hartford promises to run trains regularly between that city and New York in 4½ hours on the completion of the improvements in the road, which are now in progress, particularly the rebuilding of drawbridges at Cos Cob, Westport and Saybrook.

The new passenger terminal of the Central of New Jersey at West Twenty-second street, New York City, is to be opened for business on June 25. On the establishment of this ferry the Central's ferry to Whitehall street ("South ferry") will be discontinued. The Whitehall terminal has been acquired by the city of New York.

For the past three months the Lake Erie & Western has been running fast freight trains over its main line (Sandusky and Peoria, 416 miles) daily in each direction; and General Freight Agent Sweet says that in this time only four trains have been late at destination. The rate of speed made by these trains is not mentioned, but such punctuality is commendable, whatever the speed.

The new grain elevator of the Illinois Central at New Orleans, built to take the place of that destroyed by fire last winter, is practically finished, and, it is said, will be put into use next week. This elevator has a capacity of 1,500,000 bushels and has been built very fast, the job being finished more than a month ahead of the calculated time.

A press despatch from Chicago says that the Chicago, Milwaukee & St. Paul is no longer running Sunday excursion trains to certain points in South Dakota, for the reason, it is stated, that the excursionists do not behave well in the places to which they are taken. It is said also that the road is to run as few freight trains on Sunday as possible.

The Supreme Court of Mississippi, in a suit against the Natchez Street Railway, has decided that the separate car law of that State is not complied with by putting up signs in the cars requiring white passengers to sit at one end and colored passengers at the other. It is held that the separation of the races must be absolute, as by a partition or screen.

The Lake Shore & Michigan Southern has established a new stock-train schedule from Chicago to Buffalo intended to take animals through in 28 hours, thus obviating the necessity of unloading on the road for feeding and resting. New orders have been issued to agents calling attention to the necessity of compliance with the Federal law, forbidding the confinement of animals in cars more than 28 hours.

It is announced that the Michigan Central is to adopt the standard code of rules for the movement of trains by telegraphic orders, this being done to make the practice on that road more nearly uniform with that of other roads in the New York Central system. This means an important change, as the Michigan Central has, up to the present time, kept in use the old methods under which the duplicate order system had no recognition.

Philadelphia newspapers say that the decision of the New York, New Haven & Hartford discontinuing the movement of coal to New England by rail from New York harbor will lead to the immediate construction of additional tugs and barges by the Reading road for use in carrying coal direct by water to New England ports. The Reading has recently contracted for the construction of a coal storage plant at a New England port.

According to Philadelphia papers the superintendents of several divisions of the Pennsylvania road have lately been making surprise tests of enginemen, one method being to cut or disconnect the wires leading to automatic block signals, so as to set them in the stop position at or just before the time that an engineman approaches them. For disregarding a signal an engineman is suspended three days; for the second offence he is transferred to a less important division, and for the third offence the penalty is dismissal.

The two officers of the Pere Marquette at St. Thomas, Ontario, who were threatened with deportation under the Canadian Alien Labor act have been ordered released, Justice Anglin, of Toronto, holding that the law cannot be enforced because a Canadian constable cannot act on United States soil, and therefore could not effectually deport a man. Counsel for the accused had held also that the Alien Labor act was invalid, because it is in conflict with the treaty of Paris of 1794, in which Great Britain and the United States agreed that citizens should at all times freely pass and repass between Canada and the United States.

The Colorado flyer of the Atchison, Topeka & Santa Fe was put in service for the summer on June 4. It leaves Chicago at 8.40 a. m., reaches Kansas City 8.10 p. m. and Denver 3 p. m. next day. On the circular announcing this train the Atchison has added to its trade-mark the words "block signals."

The Canadian Pacific school of telegraphy and shorthand at Montreal for the benefit of employees, has now been running for about a year, and it has over one hundred pupils; about 70 in the shorthand classes and 40 in the telegraph classes. The classes are held in the evening and instruction is given by employees of the company, who receive extra pay for the service. The students are practically all in the service of the company in and around Montreal, only one or two coming from any distance. Students have to pay a small fee, which is refunded at the end of six months if they have attended faithfully to their studies. The company has just opened similar classes in Winnipeg.

The Kennicott Water Softener Company's New Plant.

The Kennicott Water Softener Company has acquired several acres of ground at Chicago Heights, Illinois, on which it is building a new plant, which will consist of a main building 80 feet wide by 30 feet long, together with office buildings arranged for office, drafting room and laboratories, 40 feet by 46 feet, two stories high. The other buildings will consist of power house, 40 feet by 50 feet, and a machine shop 35 feet by 80 feet. The buildings will be of brick, steel and tile construction throughout.

The main building is to be equipped with a traveling crane of 80-foot span, the crane being arranged to cover the entire area of the building, the roof of which is in a single span, there being no posts. The yard space is to be covered with a traveling crane of 26-foot span, erected upon steel posts. Provision is made in the main building for the entrance of cars, so that loading and unloading may be accomplished under cover. All tools are to be equipped with individual motor drive. Large purchases of machinery have been made to supplement the equipment already in use by the Kennicott Company.

Disastrous Collision at Patapsco, Md.

In a butting collision between a westbound passenger train and an eastbound freight on the Western Maryland, near Patapsco, about 30 miles northwest of Baltimore, on Saturday evening, June 17, 23 men were killed, all of them employees of the road. The passenger train (No. 5) was well filled with passengers and, in addition, carried a large gang of roadway workmen, who rode in the baggage car and on the platforms of the front portion of the train. Many of the men on the platforms were knocked off, and those inside the baggage car are said to have suffered more severely than those on the steps. The passengers were injured only by cuts from flying glass and from minor bumps. The collision occurred on a sharp curve. It is said that the freight train was running on the time of the passenger in violation of an order, but all of the men on the two engines of the freight train appear to have been killed.

Fatal Accidents With Small Cars.

John Bolton, Roadmaster of the Rock Island at Chickasha, Okla., was killed on May 26 by being thrown from a small motor car on which he was riding, and Division Engineer J. C. Breedlove was fatally injured. The

two men were the only occupants of the car, and there is no explanation of the cause of the disaster, except that, presumably, the car was being run at too high speed.

At Newport News, Va., June 2, Vincent Godwin, a civil engineer, was killed while riding on a railroad velocipede, the car having jumped the track while being run at high speed.

New Signals on the Pennsylvania.

The Pennsylvania Railroad is to extend its automatic block signal installation on the Philadelphia division westward about 14 miles, from Downingtown to Atglen. Atglen is 47 miles from Philadelphia. This will make continuous automatic block signaling from Jersey City to Atglen, about 132 miles.

Reduced Accident Benefits.

The manager of the Carnegie Relief Fund, which pays death and accident benefits to employees of the various corporations connected with the Carnegie mills at Pittsburg, including the Union Railroad and the Bessemer & Lake Erie, announces that after the first of July an injured person will receive accident benefits only after one year from the date of injury; for an injury lasting less than 366 days nothing is granted. Heretofore the benefits have begun to accrue 14 days after the accident. The change has been made, presumably, to check the fraudulent and semi-fraudulent practice of drawing money from the relief fund when no actual necessity existed. This vicious practice has been observed in various benefit organizations, but we have never before heard of the application of so radical a remedy. The rates paid by the Carnegie fund are 75 cents a day for unmarried men and one dollar a day for married men. Benefits are paid at these rates for 52 weeks, and then, if necessary, at half these rates for the remainder of the time during the continuance of the disability. The Carnegie fund differs from other benefit funds in that the whole of the money is provided by the gift of the founder.

New River and Lake Steamers.

The Hudson River Day Line has ordered a new steamer to carry 5,000 passengers. It is to be finished in time for the season of 1906. It will be 400 ft. long and 82 ft. beam, with 14 ft. depth of hold. The contract speed is twenty-three miles an hour. No freight will be carried. The hull is to be built by T. S. Marvel, of Newburgh, N. Y.; the engines by W. & A. Fletcher, of Hoboken, N. J.; the boilers by the New York Shipbuilding Co., of Camden, N. J., and the joiner work by John Englis & Son, of New York.

The Detroit & Cleveland Navigation Co. has ordered a new passenger steamer with a contract speed of twenty-four miles an hour for the Cleveland-Detroit service. The new steamer will be 442 ft. long and 85 ft. beam, with a freight capacity of 110 carloads and a passenger capacity of 4,500 people. There will be seven decks and 350 staterooms. The new boat is to cost $1,000,000, and is to make the run between Cleveland and Detroit in five hours.

The Truckee-Carson Canal.

A press despatch from Reno, Nev., June 17, says the Truckee-Carson Canal was opened on that day for a distance of 31 miles, irrigating about 50,000 acres. During the next two years it is contemplated to irrigate about 150,000 acres additional. Eventually the whole system will cost about $9,000,000. This canal has been constructed by the Government under the Reclamation act. The main canal runs from Derby, 15 miles east of Reno, on the Truckee River, to a point 10 miles above Leeteville, on the Carson River, 31 miles. The entire system as projected will not be completed for nine or ten years and will cost about $9,000,000. After the initial work is finished and the first section of land is placed under irrigation the remainder of the work will be carried out with the proceeds of the sale of Government land adjacent to the ditches and of the sale of water to the settlers who are expected to take up the land.

Frank C. Randall.

Mr. Frank C. Randall has resigned the position of Vice-President and General Manager of the National Electric Company and joined the Allis-Chalmers Company as District Manager for the District of New York with headquarters in New York City. Mr. Randall's railroad company service was as "performance of engines" clerk and later chief clerk of the Motive Power Department on the New York & New England. He was afterwards chief clerk of the Motive Power Department of the Boston & Lowell, and held this position until the consolidation of the road with the Boston & Maine. He then entered the shops of the Tripp Manufacturing Company, making car trucks, and was foreman and later Superintendent of the works. He was for six years Sales Agent for the J. G. Brill Company, and later, General Sales Agent for the Christensen Engineering Company and Vice-President and General Manager of its successor, the National Electric.

Safety in Coupling Cars.

Superintendent J. S. Matson, of the Bessemer & Lake Erie, lately issued the following notice to employees, laying down the procedure that should be followed in the management and handling of automatic car couplers:

"Employees whose duties require them to couple or uncouple cars are hereby enjoined to use care, and under no circumstances go between the ends of the cars, for the purpose of coupling or uncoupling or to adjust the knuckles, when train or cars are in motion.

"When knuckles refuse to open and it is necessary to open them with the hand, the portions of the train or the cars to be coupled should be separated, and stopped at a sufficient distance apart to obviate the possibility of cars coming together while adjustment is being made, by reason of the slack running out of the train or cars."

Manufacturing and Business.

The Newport News Shipbuilding & Drydock Co., is about ready to build a new drydock at Newport News, Va.

A contract is reported let to the Mesta Machine Co., of West Homestead, Pa., for 1,000 tons of steel castings for S. Pearson & Sons, Ltd. This is the first of a number of contracts which will call for 25,000 tons of castings.

The Dayton Pneumatic Tool Co. has opened an office in San Francisco at 421 Market street. Mr. Henry Engels will be in charge.

Bids have been asked by the Lake Shore & Michigan Southern for rebuilding its water works system at Elkhart, Ind., at an estimated cost of $20,000, also for putting in two new pumps with a capacity of 1,500,000 gallons a day.

Mr. W. S. Heger, whose name has been closely associated for years with the Westinghouse interests, has joined the Allis-Chalmers Company, Milwaukee, Wis., becoming Assistant to the Vice-President and General Manager.

The Lima Locomotive & Machine Co., of Lima, Ohio, announces the appointment of Mr. George L. Wall, late Assistant Engineer of Motive Power at Fort Wayne, of the Pennsylvania Lines West of Pittsburg, as Mechanical Engineer.

The Bethlehem Steel Company, South Bethlehem, Pa., announce that Mr. D. K. Hamilton has been appointed Sales Agent of the company in charge of sales of railroad material, including locomotive forgings of all kinds, iron and steel castings and staybolt iron.

The Curtain Supply Co. has bought the curtain and curtain fixture departments of the Garford Co., formerly the Federal Manufacturing Co., of Elyria, Ohio, who made the Keeler "Pinch Handle" and Keeler "Eccentric" curtain fixtures, and has removed these departments to its works at 85-93 Ohio street, Chicago.

The Bethlehem Steel Co., South Bethlehem, Pa., state that since January 1, upwards of 500 new locomotives have been fitted with staybolts made of Bethlehem "special" high-grade staybolt iron. The demand for the above iron has increased to such an extent that the company has had to double the capacity of its "special" rolling mill.

The Westinghouse Electric & Mfg. Company has just closed a contract for the equipment of the main generating station and four rotary converter sub-stations of the Cincinnati Northern Traction Co. The power house will be located at Hamilton, Ohio. The installation will be of 5,000 kw. capacity, with provisions for ultimately increasing it to 10,000 kw.

The Locomotive Appliance Co., of Chicago, announces the appointment of Mr. A. L. Moler as Traveling Engineer. Mr. Moler was for some time in charge of the erecting department of the Baldwin Locomotive Works, and has also served as Master Mechanic on the Cincinnati, Hamilton & Dayton, the Queen & Crescent, the Chicago & Alton and the Chicago, Cincinnati & Louisville.

J. G. White & Co., of New York, announce the appointment of Mr. George R. Wadsworth, Resident Engineer on the New York Central, as Assistant to the Construction Superintendent. Mr. Wadsworth is a graduate of the Massachusetts Institute of Technology as a civil engineer in the class of 1896. He has been Assistant Engineer of the New York Central & Hudson River and has just resigned as Resident Engineer of the Hudson district, in charge of contract work from Mott Haven to Croton.

Two orders for heating and ventilating equipment for the Pennsylvania Railroad, were recently taken by the B. F. Sturtevant Co., of Boston, Mass. One was for the new machine shop at Renovo, Pa., which con-

tains nearly three-quarters of a million cubic feet of space, and requires for its heating to 65 degrees in zero weather, a large steel plate engine-driven fan, with heater, and a system of underground ducts with outlet connections. The other was for the Trenton shops, which include machine and erecting shop, paint shop and planing mill, containing over four and one-half million cubic feet of space, and requiring half a dozen fans with the necessary heaters and systems of distributing pipes.

At the meeting of the Executive Committee of the Railway Supply Men's Association, Monday, June 19, Mr. F. K. Shults, of the Camel Company, was elected chairman for the ensuing year. Mr. D. C. Noble, of the Pittsburg Spring & Steel Co., was elected Treasurer and Mr. L. B. Sherman, Western manager of the *Railroad Gazette*, was elected Secretary to succeed Mr. J. Alexander Brown. For next year's convention Mr. A. L. Whipple, of the Curtain Supply Co., was elected chairman of the Entertainment Committee and Mr. R. T. Walbank, of the Glidden Varnish Co., was elected chairman of the Transportation Committee. A new committee to be known as the Enrollment Committee will have charge of the enrollment of delegates and guests next year under the direction of Mr. F. L. De Armond, of the Protectus Company, who will report to the Treasurer.

The United States Light & Heating Co., New York, has on exhibition at the Mechanical Conventions at Manhattan Beach, the latest improved form of electric car lighting apparatus of the Moskowitz system. The apparatus is simple and efficient and it is claimed that light can be produced at a cost not exceeding that of gas illumination. No mechanical movements or rotating parts are employed in governing the output of the dynamo according to the speed of the car axle, and by the application of an ingenious method of field regulation, a constant voltage is delivered at the commutator at all speeds of the car. When the movement of the car is reversed the polarity of the dynamo is reversed without introducing complicated mechanism involving additional rotating parts and extra bearings. The main armature bearings are the only points in the entire system which need lubrication. This system of axle lighting is in use on Lackawanna dining cars between New York and Buffalo, on the Empire State Express on the New York Central and on a number of English railroads. Four other railroads in the United States have also placed orders recently for this system.

The Ingersoll-Sergeant Drill Company and the Rand Drill Company have been united into a new company called the Ingersoll-Rand Company. The new corporation was formed under the laws of New Jersey with a capital of $10,000,000, of which $5,000,000 is preferred stock and the balance common. The factories of the two companies are located at Phillipsburg, N. J.; Easton, Pa.; Tarrytown, N. Y.; Ossining, N. Y.; Painted Post, N. Y.; 34th St., New York City and Sherbrooke, Quebec. They will all be operated. The officers of the Ingersoll-Rand Company are as follows: President, W. L. Saunders, formerly President of the Ingersoll-Sergeant Drill Company; First Vice-President, Geo. Doubleday, formerly Treasurer of the Ingersoll-Sergeant Drill Company; Vice-Presidents, Jaspar R. Rand, formerly President of the Rand Drill Company; John A. McCall, President of the New York Life Insurance Company; J. P. Grace, Vice-President of W. R. Grace & Co.; Geo. R. Elder, General Manager of the Manufacturing Department; Treasurer, W. R. Grace, formerly Secretary of the Ingersoll-Sergeant Drill Company; Secretary, F. A. Brainerd, formerly Treasurer of the Rand Drill Company. For the present the main offices of the new company will be located at 26 Cortlandt street, New York.

Iron and Steel.

Plans are being made by the Carnegie Steel Co. to put up a large rail mill as an addition to the Edgar Thomson Steel Works at Braddock, Pa., to cost approximately $1,000,000. This will more than double the rail capacity of the works. About the first of next month, the rail mill of the Carnegie Co. at Youngstown, Ohio, which has been idle since October, 1903, will be put in operation, giving employment to about 500 men.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

International Y. M. C. A.

The twelfth international conference of the Railroad Department of Young Men's Christian Associations will be held in Detroit September 28-October 1. Railroad associations and departments are cordially invited to send an unlimited number of representatives, also railroad men from unorganized points, railroad officials, state and provincial secretaries, and general secretaries of city associations at railroad centers. Wherever possible, railroad men and railroad secretaries should secure their own transportation through to Detroit. But in the case of those who are unable to secure transportation from connecting lines, the International Committee will endeavor to make arrangements whereby free transportation can be obtained for a limited number of delegates from each point. The Pullman Company has granted one fare for the round trip. Lucien C. Warner, 3 West 29th street, New York, is Chairman, and John J. McCook is Chairman Railroad Committee.

PERSONAL.

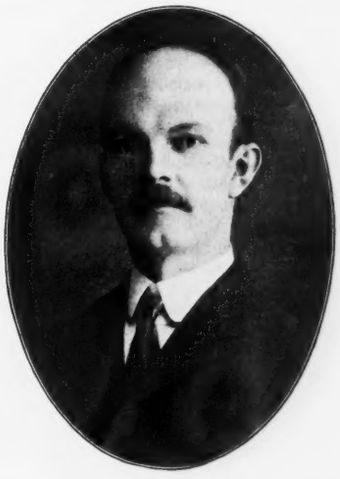
—Mr. T. C. M. Shindler, formerly General Freight Agent of the Detroit Southern, has been appointed Special Agent of the Bureau of Corporations of the Department of Commerce and Labor.

—Professor William G. Raymond, Dean of the College of Applied Science of the State University of Iowa, has received from Washington University, St. Louis, the degree of doctor of laws.

—Mr. M. J. Buckley, the new General Superintendent of the Oregon Railroad & Navigation Co., and the Southern Pacific lines in Oregon, was born in 1867. His first railroad work was in 1884, as an operator on the Chicago, Milwaukee & St. Paul. He later served on the Chicago, Burlington & Northern and the Northern Pacific until 1887. Then he went to the O. R. & N., where he was operator, freight brakeman, despatcher and chief despatcher. In 1896, he was appointed Assistant Superintendent of the Washington division and in 1900 was transferred to the same position on the Oregon division. In 1904, he was made Superintendent of the Oregon division, which position he held until this last promotion.

—Mr. Thomas B. Kennedy, President of the Cumberland Valley, died at his home in Chambersburg, Pa., on June 19. Mr. Kennedy was born in Warren County, N. J., Aug. 1, 1827, and was graduated at Marshall College in 1844. He led a party of Pennsylvanians to California in the days of the forty-niners, but returned to Pennsylvania in 1851 to practice law at Chambersburg. In 1882, he succeeded Frederick Watts as President of the Cumberland Valley. One of his sons, M. C. Kennedy, is Vice-President and General Superintendent of the road.

—Mr. A. W. Jones, who has been appointed Assistant Engineer of the Missouri Pacific, in charge of the building of the White River division, was born in 1868 and was graduated from the University of Georgia. He began work on the Augusta Southern and was later Locating Engineer and Resident Engineer on the Seaboard Air Line. In 1891, he



went to the Buffalo, Rochester & Pittsburg, where he served as Resident Engineer and Division Engineer and some years later as Assistant Engineer. Next he went to the Chicago, Milwaukee & St. Paul as Division Engineer of Construction. Since that time, he has been Locating Engineer on the New York Central.

—Mr. George Geiger, recently appointed Superintendent of the Wellston and Delphos divisions of the Cincinnati, Hamilton & Dayton, was born at Davenport, Iowa, on Feb. 28, 1872. When nine years old he became a messenger boy on the Chicago, Rock Island & Pacific, continuing his studies in a night school; and in June, 1884, he was made operator. In July, 1885, he went to the St. Louis, Iron Mountain & Southern as operator, and

the next year to the International & Great Northern as operator and agent at various stations. From November, 1889, to January, 1891, he served as operator and despatcher on the Panama Railroad at Aspinwall. In 1891, he returned to the United States and served as despatcher, chief despatcher and trainmaster on the St. Louis Southwestern. From June, 1898, to January, 1902, he was trainmaster on the Kansas City Southern, and then for a time on the Rio Grande West

ern. He was then Assistant Superintendent of the R. G. W. for three years; but has now left and gone to the Cincinnati, Hamilton & Dayton, as above noted.

—Mr. R. A. McCranie, who on July 1 will be appointed Superintendent of Terminals for the Atlantic Coast Line at Jacksonville, Fla., was born in 1871. He has always been in the employ of that company and its predecessor, the Plant System. In 1888 he began as an operator and when he was 19 was Despatcher, later being Chief Despatcher and Trainmaster. Mr. McCranie is now Trainmaster of the Savannah district of the Atlantic Coast Line, but leaves that position to take the newly created post of Superintendent of Terminals at Jacksonville.

—Mr. Charles M. Levey, who has been appointed Third Vice-President of the Northern Pacific, with headquarters at Tacoma, Wash., was an officer of the Chicago, Burlington & Quincy from 1881 to 1904, when he became Assistant to the President of the Northern Pacific at Tacoma. Mr. Levey began railroad work as a telegraph operator on the Burlington in 1873 and filled various positions in the operating department. In 1881, he was appointed Assistant Superintendent at Burlington, Iowa. On Jan. 1, 1883, he was appointed Superintendent of the St. Louis, Keokuk & Northwestern and the Chicago, Burlington & Kansas City roads (parts of the Burlington system), and in 1886 he was made General Superintend-

ent of the same lines. He held this position until June 1, 1892, when he was appointed Superintendent of the Iowa lines with headquarters at Burlington, Iowa. On May 1, 1902, he was appointed General Manager of the Missouri lines, with headquarters at St. Louis, Mo., which position he left in February, 1904, to go to the Northern Pacific. After a little more than a year of service with the Northern Pacific, he has been made Third Vice-President, with general supervision over the affairs of that company in Oregon, Washington and Idaho.

—Mr. Henry S. Drinker has been elected President of Lehigh University. Mr. Drinker entered the employ of the Lehigh Valley Coal & Railroad Co. immediately after his graduation from the Lehigh School of Mines in 1871. He had charge of the building of the Musconetcong tunnel on the New Jersey extension of the Lehigh Valley. After studying law, he was made Counsel for the road and later General Solicitor. At the time of the Reading lease, he was appointed Assistant to the President. After the dissolution of the lease, he served through six successive administrations as General Solicitor of the Lehigh Valley.

—Mr. J. B. Dickson, who has been appointed Chief Engineer of Maintenance of Way of the Baltimore & Ohio, was born at Steubenville, Ohio, and entered railroad service in the maintenance of way department of the Cleveland & Pittsburg division of the Pennsylvania Lines West of Pittsburg. He was soon appointed Supervisor of the division, but left to become Roadmaster of the Chicago terminals of the Chicago & North-Western. He was later transferred to

the Galena division of the same road. On Jan. 1, 1902, he went to the Baltimore & Ohio as Assistant Engineer of Maintenance of Way and one year later was appointed Engineer of Maintenance of Way of the Baltimore & Ohio system. As part of the recent reorganization of the maintenance of way department of the Baltimore & Ohio, Mr. Dickson was, on June 1, 1905, appointed Chief Engineer of Maintenance of Way.

—Mr. H. W. Forman, author of "Rights of Trains on Single Track," has resigned his place on the Denver & Rio Grande, and has gone to the Nashville, Chattanooga & St. Louis, where he has been appointed trainrule examiner. His office will be at Nashville.

—Mr. O. S. Keith, the new Superintendent of Transportation of the Illinois Central, was born at Henry, Ill., in 1867. All of his railroad service has been on the Illinois Central. He has been messenger boy, operator,

chief clerk to the Superintendent of Car Service and chief clerk to the Superintendent of Transportation. In 1892 he was made Car Distributor, and on Sept. 1, 1901, chief clerk to the General Superintendent of Transportation. On December 1 of the same year he was appointed Car Accountant, and in June, 1904, General Car Distributor. With Mr. Ross's resignation, the position of General Superintendent of Transportation was abolished and Mr. Keith was appointed to be Superintendent of Transportation.

—Mr. J. O. Potts, who has been appointed Assistant Engineer of Maintenance of Way on the Missouri Pacific and the St. Louis, Iron Mountain & Southern, was born at Hannibal, Ohio, and attended the village school there. With this schooling as his education, he began railroad work as bridgeman on the Pittsburg, Cincinnati, Chicago & St. Louis. After about two years he was made lumber and tie inspector, and in 1895 was appointed storekeeper on the Logansport division. In 1897, he was made assistant master carpenter, and in 1899 master carpenter on the Chicago Terminal division. In 1901 he went to the Baltimore & Ohio as maintenance of way inspector, the first on that road. In this position his territory covered the entire system, and he introduced the practice of having one man on each division mark ties for renewal instead of having it done by the section master, a plan which has since been adopted by several other railroads. On March 1 of the present year he left the Baltimore & Ohio to become General Tie and Timber Inspector on the Missouri Pacific, and on May 19 was promoted to be Assistant Engineer of Maintenance of Way; a notable example of the success of one who has educated himself in and by his work.

ELECTIONS AND APPOINTMENTS.

Albany & Hudson.—A. P. Deeds has been appointed Assistant General Manager.

Arkansas Southern.—Henry Rohner has been appointed Chief Engineer, with headquarters at Rushton, La.

Atchison, Topeka & Santa Fe.—William Nicholson, Chief Clerk of the passenger department, has been appointed General Colonization Agent, with office at Chicago.

D. E. Cain, General Superintendent of the Eastern Grand division, has resigned.

Atlantic Coast Line.—R. A. McCranie, Trainmaster of the Savannah district, has been appointed Superintendent of Terminals at Jacksonville, Fla. Mr. McCranie will be succeeded by D. S. McClellan, Chief Dispatcher.

Baltimore & Ohio.—A test bureau has been established in charge of J. R. Onderdonk, who has been appointed Engineer of Tests, with headquarters at Baltimore. He will report to the General Manager. To this bureau will be submitted for analysis, inspection and test all equipment, materials and appliances bought under specification. All experiments on or with equipment, materials and appliances will be made under the direction of the Engineer of Tests. Specifications for equipment, materials and appliances will be prepared by the various departments as at present.

Chicago, Burlington & Quincy.—The office of J. E. Murphy, Engineer of Maintenance of Way, has been moved from Galesburg, Ill., to Chicago.

Chicago, Rock Island & Pacific.—F. O. Melcher, General Superintendent of the Choctaw district, has been appointed General Manager of the Central and Northern districts, with headquarters at Chicago. D. E. Cain, General Superintendent of the Eastern Grand Division of the Atchison, Topeka & Santa Fe, has been appointed General Manager of the Southwestern and Choctaw districts, with headquarters at Topeka, Kan. The office of General Superintendent of Transportation has been abolished and W. M. Hobbs, General Superintendent of Transportation, has been appointed Assistant to the Second Vice-President, in charge of transportation matters.

Cincinnati, Hamilton & Dayton.—J. F. White, Engineer of Maintenance of Way, has been apointed Superintendent of the Northern and Southern divisions, with headquarters at Dayton, Ohio, succeeding R. H. Bowron, promoted.

A. C. Hinckley, Master Mechanic of the Northern and Southern divisions, has been appointed Master Mechanic of the entire Cincinnati, Hamilton & Dayton, with headquarters at Lima, Ohio. Theoffice of Superintendent of Motive Power, heretofore held by F. Mertsheimer, has been abolished.

Colorado, Texas & Mexico.—M. Sweeney, formerly Superintendent of the Iowa Central and the Minneapolis & St. Louis, has been appointed General Manager of this projected road, with headquarters at Red River, Tex.

Delaware, Lackawanna & Western.—Walter W. Ross, General Counsel, has resigned.

Great Northern.—J. W. Searle, Livestock Agent at Butte, Mont., has been appointed Western Industrial Agent, with headquarters at Spokane.

Gulf & Ship Island.—The authority of F. B. McCutcheon, Chief Engineer, has been extended over the roadway, bridges and buildings, with headquarters at Gulfport, Miss.

Iowa Central.—See Minneapolis & St. Louis.

Kansas City Southern.—T. E. Jarrett has been appointed Superintendent of the Southern division, with headquarters at Texarkana, Tex., succeeding M. J. Sullivan, asigned to other duties. The office of General Superintendent has been abolished.

Louisville & Nashville.—William D. Dickinson, Third Vice-President, has resigned to engage in private business.

Louisiana & Northwest.—Hugh C. Brown has been appointed Manager, with headquarters at Rushton, La. G. R. Wansbrough, General Freight and Passenger Agent, has resigned. The office of General Freight and Passenger Agent has been abolished, and all communications pertaining to traffic and traffic claims should be addressed to Mr. Brown.

Mexican Central.—C. R. Hudson, President of the San Antonio & Aransas Pass, has been elected a Vice-President and a member of the board of directors of the M. C.

Minneapolis & St. Louis.—M. Sweeney, General Superintendent of the Minneapolis & St. Louis and the Iowa Central, having resigned, the office of General Superintendent has been abolished. D. C. Noonan has been appointed Superintendent of the Minneapolis & St. Louis with headquarters at Minneapolis. Officers and employees of that road heretofore reporting to the General Superintendent, will report to the Superintendent.

E. P. Lovell has been appointed Car Accountant of the Minneapolis & St. Louis and the Iowa Central, with office at Minneapolis.

New York Central & Hudson River.—J. W. Eber, Assistant to the Engineer of Maintenance of Way, has been appointed Engineer of Track.

George R. Wadsworth, Resident Engineer of the Hudson disctrict in charge of contract work from Mott Haven to Croton, has resigned.

New York, New Haven & Hartford.—C. T. Hempstead, General Passenger Agent, has retired and will be pensioned, and A. C. Kendall, General Passenger Agent of the lines east of New London and Willimantic, has been appointed General Passenger Agent of the entire road.

F. C. Coley has been appointed Assistant General Passenger Agent, with office at New Haven. O. H. Taylor will continue as General Passenger Agent of the New England Navigation Co. and other water lines controlled by the New York, New Haven & Hartford.

Oregon Short Line.—A. E. Hutchinson, Chief Clerk to the General Purchasing Agent, has been appointed General Purchasing Agent, succeeding J. O. Rhoades, resigned. See Southern Pacific.

Panama.—Mr. Henry Burnett, who has been Assistant Manager of the Cuban Railroad. Puerto Principe, Cuba, has been appointed Superintendent of Transportation of the Isthmian Canal Commission, with headquarters on the Isthmus of Panama.

Pennsylvania.—Robert H. Groff has been appointed Assistant Treasurer and Registrar of Bonds, and J. W. Marshall, Assistant Treasurer and Assistant Registrar of Bonds, both with headquarters in New York City. G. B. Robinson has been appointed Assistant Registrar of Bonds with headquarters at Philadelphia.

Montgomery Smith, Assistant to the Purchasing Agent, has been appointed Additional Purchasing Agent. He is succeeded by George Grone, Chief Clerk in the Purchasing department.

Pennsylvania Lines West (Northwest System.)—George L. Wall, Assistant Engineer of Motive Power at Fort Wanye, has resigned.

Seaboard Air Line.—J. F. Robinson, Acting Master Mechanic, has been appointed Master Mechanic of the Fourth and Fifth divisions, with jurisdiction over the Savannah and Americus shops.

Southeastern Freight Association.—E. H. Hinton, Traffic Manager of the Tennessee Central, has been appointed Chairman, with headquarters in Atlanta, succeeding S. F. Panott, resigned.

Southern.—W. D. Hines, Assistant Engineer at Washington, has resigned.

Southern Pacific.—Ira O. Rhoades, General Purchasing Agent of the Oregon Short Line, has been appointed Manager of Purchases and Supplies of the Atlantic and Pacific systems, with headquarters at San Francisco, succeeding Richard Stevenson, deceased.

Tennessee Central.—E. H. Hinton, Traffic Manager, has resigned. See Southeastern Freight Association.

LOCOMOTIVE BUILDING.

The Missouri, Kansas & Texas has ordered 30 locomotives from the Baldwin Locomotive Works.

The Michigan Central is reported to have ordered several heavy compound freight locomotives from the Locomotive & Machine Works Company, of Montreal (American Locomotive Company).

The Chicago, Burlington & Quincy has ordered 10 Atlantic type (4-4-2) locomotives from the Baldwin Locomotive Works. These locomotives will weigh 196,600 lbs., with 101,200 lbs. on the drivers; cylinders, 15 in. and 25 in. x 26 in.; diameter of drivers, 78 in.; radial stayed boiler, with a working steam pressure of 210 lbs.; heating surface, 3,206 sq. ft.; 264 tubes, 2¼ in. in diameter and 19 ft. long; firebox, 96⅛ in. x 66¼ in.; grate area, 44.14 sq. ft.; tank capacity, 6,000 gallons, and coal capacity, 12 tons.

The Butte, Anaconda & Pacific has ordered two compound Mastodon (4-10-0) locomotives from the Schenectady Works of the American Locomotive Co., for July delivery. These locomotives will weigh 212,740 lbs., with 173,480 lbs. on drivers; cylinders, 23 and 34 in. x 32 in.; diameter of drivers, 56 in.; extended wagon-top boiler, with a working steam pressure of 210 lbs.; heating surface, 3,380 sq. ft.; 414 Shelby seamless tubes, 2¼ in. in diameter and 15 ft. long; firebox, 120 3/16 in. x 42 in.; grate area, 34¾ sq. ft.; tank capacity, 5,500 gallons, and coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, Cambria (Coffin treated) axles, "Little Giant" bell ringers, Keasbey & Mattison magnesia boiler lagging, Janney couplers, Ohio injectors, Magnus journal bearings, Jerome piston and valve rod packings, Hancock safety valves, Leach sanding devices, Detroit bull's-eye sight-feed lubricators, Railway Steel Spring Co.'s springs, and Latrobe driving and truck wheel tires.

The Canadian Pacific, as reported in our issue of June 2, is building three simple Pacific type (4-6-2) locomotives with superheaters at its Angus shops. These locomotives are to weigh 210,000 lbs., with 135,000 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 75 in.; radial wagon-top boiler, with a working steam pressure of 200 lbs.; total heating surface, 3,122 sq. ft.; 227 iron tubes, 209, 2¼ in. in diameter, and 18, 5 in. in diameter, all 20 ft. long; steel firebox, 102⅛ in. x 92 in.; grate area, 65 sq. ft.; tank capacity, 5,000 imperial gallons, and coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, Krupp steel axles, "Little Giant" bell ringers, magnesia boiler lagging, simplex tender brake-beams, Canadian Pacific standard brake-shoes, Washburn pilot couplers, Tower tender couplers, Hancock (No. 10) injectors, Canadian Pacific standard journal bearings, United States metallic piston and valve rod packings, World safety valves, Canadian Pacific sanding devices, Richardson sight-feet lubricators, crucible steel springs, Star steam gages, Krupp crucible driving wheel tires, Krupp open-hearth truck wheel and tender wheel tires, and crucible steel wheel centers.

CAR BUILDING.

The Chicago & North-Western is reported to have ordered 500 refrigerator cars.

The Chicago, Rock Island & Pacific has ordered 34 passenger cars from the Pullman Co.

The Japanese Government is reported to have ordered 900 box cars from the Pressed Steel Car Co.

The St. Louis & San Francisco is reported to have ordered 1,500 steel hopper coal cars of 100,000 lbs. capacity.

The Merchants' Despatch Transportation Company will build 125 standard refrigerator cars at its Despatch shops.

The Atchison, Topeka & Santa Fe is reported to have ordered 50 refrigerator cars in addition to the 300 reported in our issue of May 12.

The Chilean Electric Tramways, of Chile, are reported to have ordered 10 double-deck cars from the J. G. Brill Co. These cars will be 17 ft. 6 in. long, and 7 ft. 10 in. wide.

The Lehigh Valley, as reported in our issue of May 12, has ordered 100 side-dump steel cinder cars of 80,000 lbs. capacity from the Standard Steel Car Co. These cars will be 36 ft. long, 9 ft. 11⅜ in. wide, and 7 ft. 11¼ in. high. all outside measurements. The special equipment includes: American cast-steel bolsters, Westinghouse air-brakes, Magnus Metal Co.'s brasses, Gould friction draft rigging, Symington dust guards and journal boxes, Protectus paint, and Railway Steel Spring Co.'s springs.

The Panama Railroad has ordered six passenger cars, 12 cabooses and 500 freight cars from the American Car & Foundry Co. These cars are to be delivered, ready for service, at Colon. All cars are to be 5 ft. gage changeable to 4 ft. 8½ in. gage, if required. The passenger cars are to be 61 ft. long and 10 ft. wide over sills, 10 ft. 4¼ in. wide over all, and 6 ft. 10 in. high from top of sill to bottom of plate. They are to have a seating capacity of 70 persons; an anti-telescopic device consisting of a ¾-in. flitch plate in end sill and ½-in. x 8-in. plates on side sill 20 in. back from end sill; flooring, double ⅞-in. diagonal edge grain yellow pine; roof covering, No. 6 cotton duck laid over paper felt with copper flashing; inside finish, plain mahogany; double 7 x 1-in. iron bolsters, rattan seat and back covering, spiral seat and back springs, "Bell" hopper ventilators, no curtains, continuous basket racks on both sides, Standard Steel platforms, Janney-Buhoup

steel couplers, crucible steel springs, and New York air-brakes, Westinghouse air-signal, painting and outside decorations to be the same as the "Alton Limited" train, 33-in. Paige steel tired wheels, Latrobe tires, steel axles, Adlake hand-brakes, Crosby brake-heads and Streeter brake-shoes. The caboose cars are to be four-wheel type and similar to the cabooses recently built by the American Car & Foundry Co. at its St. Louis Works for the Toledo, St. Louis & Western. They will measure 18 ft. long over end sills, 9 ft. wide over side sills and 6 ft. 2 in. high from sill to plate. The special equipment will include: New York air-brakes, Sterlingworth brake-beams, Tower couplers, pressed-steel journal box lids and American Car & Foundry Co.'s wheels. The box cars are to be of 80,000 lbs. capacity, and measure 36 ft. 8½ in. long over end sills and 9 ft. 2 in. wide over side sills, 36 ft. long, 8 ft. 6 in. wide and 8 ft. high (inside measurements), 7 ft. 9¾ in. high between sill and plate, 4 ft. high from rail to top of floor, with wooden frames and underframes. The special equipment will include: Hutchins plastic roofs, Miner tandem draft rigging, Security side door fixtures, Chicago or Tower steel couplers, crucible steel drawbar springs, Simplex body bolsters, New York air-brakes, paint from Charles R. Long, Jr., & Co., or of equal quality, and Simplex bolsters.

BRIDGE BUILDING.

Akron, Ohio.—The plans submitted by the Baltimore & Ohio for a bridge over East North street have been approved by the City Council.

Alpharetta, Ga.—Bids are wanted July 6 by the County Commissioners of Gwinnett County and H. I. Searle, Ordinary of Milton County, for putting up four steel bridges of a combined length of 950 ft. over the Chattahooche river at Jones,' McClures' Abbott's and Rodgers' ferries.

Beaumont, Tex.—The Texas & New Orleans will put up a viaduct over its yards in this city to cost about $50,000.

Berwick, Pa.—A contract has been given by the State Board of Public Grounds and Buildings at Harrisburg to the York (Pa.) Bridge Co. at its bid of $209,500 for building the steel bridge over the Susquehanna river between this place and Nescopeck. Other bids were: Erle Colber, $214,000; Penn Bridge Co., $217,000; W. H. Stebbins, $218,000; Horn & Neff, $219,000; Allegar & Co., $220,000; National Bridge Co., $221,600; Eyer Construction Co., $221,950; Groton Bridge Co., $222,000; C. H. Reimard, $222,981; Canton Bridge Co., $224,200; Peter Keifer, $227,000; Jacob Veideleich, $227,500; P. E. Lane, $229,000; Pennsylvania Steel Co., $229,590; Whalen & Co., $230,000; King Bridge Co., $236,258; Berlin Bridge Co., $244,900; Riverside Bridge Co., $248,960; T. H. Prior & Son, $250,000; Belmont Iron Works, $254,800; Lane Bridge Co., $265,000; Variety Iron Works, $268,000; Old Dominion Co., $270,000; Nelson & Buchanan, $273,000; Bracket Bridge Co., $275,000; Champion Bridge Co., $280,776; John P. Cowing, $285,000.

Burlington, Iowa.—A large number of bridges and highways in Hancock County have been damaged by floods to the extent of about $250,000.

Chambersburg, Pa.—Bids are wanted for putting up an iron bridge over the Little Antietam at Stockslagers.

Denver, Colo.—Specifications have been prepared by Chief Engineer Yard for building six bridges on the line of the Denver & Rio Grande railroad between Colorado Springs and Pueblo, between which points occur frequent cloudbursts which have resulted disastrously to the road. One of these bridges will span the stream whose sudden rise, due to a torrential rainfall, caused the Eden disaster on Aug. 7, of last year. The specifications call for three 64-ft. and three 48-ft. deck girders. The work of construction will begin at once.

Edmonton, Alberta.—The Canadian Pacific will put up a high level bridge about 1,150 ft. long over the river to secure an entrance into this place.

Fresno, Cal.—The Board of Supervisors has instructed the County Surveyor to prepare plans for a steel bridge to be built over the San Joaquin river at Pollasky at a cost of about $25,000 to replace the present structure.

Knoxville, Tenn.—A contract has been given by the Southern Railway at about $100,000 to B. H. Hardaway, of Columbus, Ga., for building the piers for its new drawbridge over the Tennessee river. There will be six piers and the center pier will support a span 440 ft. long.

LaCrosse, Wis.—The bridge of the Chicago & North-Western 10 miles north of this place between Lytles and Trempealeau has been carried away by high water from the Black and Mississippi rivers.

Lorain, Ohio.—The Lake Shore Electric Railway, local reports state, is about to put up a bridge over Black river at South Lorain. It is also stated that the county will independently build a bridge in the same section for highway traffic.

New York, N. Y.—The Erie, it is said, will spend about $750,000 for improving bridges and culverts. On the Susquehanna division, about $265,000 will be spent to build 45 new bridges and culverts, including the rebuilding of the bridge over the Shenango river at Binghamton, which will be 814 ft. long; also one at Hancock 107 ft. long, and another at Deposit 143 ft. long.

Palestine, Tex.—The Missouri Valley Bridge Co., of Leavenworth, Kan., has been given a contract at about $600,000 for replacing some of the old bridges on the International & Great Northern between this place and San Antonio. Work is now under way.

Peru, Ind.—A concrete bridge 700 ft. long is proposed to be built over the Wabash at this place, to cost about $36,000.

Pittsburg, Pa.—Plans are being made for building a steel bridge over the Ohio river at Legionville Station, about 25 miles south of Pittsburg. A charter will be applied for by the Hopewell & Harmony Bridge Co. to build this structure. William D. Evans, of Pittsburg, represents the company.

Tomatlan, Mex.—The Cordoba & Huatusca will build a bridge over the ravine at this place.

Weldon, N. C.—Residents have petitioned the Board of Aldermen for a special election to authorize bonds for the purpose of building a steel bridge over the Roanoke river.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Appalachian Interurban.—Under this name, a new electric road is projected to run from Asheville, N. C., southeast through Hendersonville, Chimney Rock, Mill Spring, Columbus and Tyron, and thence to Gaffney, S. C., about 100 miles. W. A. Smith is President; F. M. Stearns, Vice-President; J. W. Wafford, Secretary, and J. M. Williams, Treasurer, of Hendersonville.

Atlantic & Birmingham.—The Callahan Construction Co., of Warmsprings Station and Bullockville, Ga., and Knoxville, Tenn., which has the contract for building this road, is asking bids for 20 miles of heavy rock and earth work in Central Georgia, through D. R. Keller, General Superintendent.

Birmingham & Lineville.—A contract has been given by this company to J. M. Memier, of Tennessee, for completing the grading on its line into Lineville, Ala.

Boston Subways.—The work on the Washington street tunnel, Boston, now under construction, is almost completed. The first section, under contract to be completed the first of last month, will shortly be finished, and on the second section, under contract to be completed about June 20, the work will be completed early in July; the third section, on which the contract calls for the completion by July 31, will not be finished until about the first of September; and about the first of next year section 4 will probably be completed. Section 5, for which the contract was recently let, is to be finished by July 1, 1906. Bids for other sections will be called for shortly, although it has not yet been definitely decided how long the new tunnel will be. On the completion of this subway, the Boston Elevated, which now operates 6.64 miles of elevated structure and 1⅜ miles of subway, including the East Boston tunnel, will operate the additional lines.

Brookville & Mahoning.—The work of building the road on the west side of the Allegheny river from opposite Mahoning to Freeport, a distance of 25 miles, has been commenced. Starting at Hyde, Elk County, where it connects with the Pittsburg, Shawmut & Northern, the Brookville & Mahoning road will run in almost a direct line to Brookville, 30 miles. Here the Low Grade division of the Pennsylvania Railroad is crossed at Freeport and connection will be made with the West Penn division of the Pennsylvania Railroad. The length of the road will be over 100 miles from Hyde to Freeport.

Canadian Valley & Western.—This company, which was incorporated in Oklahoma Territory with a capital of $3,000,000, to build a railroad from Lehigh, Ind. T., to Chickasha, a distance of 125 miles, has increased its capital to $5,000,000, and has been authorized to extend the proposed line from Tubello, Ind. T., to a point near Paris, Tex. Construction work will be commenced within the next two months. (June 2, p. 183.)

Chicago, Milwaukee & St. Paul.—Rights of way have been secured and contracts will soon be let by this company for extending the Rochelle & Southern branch from the present southern terminus at McNabb, in Putnam County, Ill., south for a distance of about 50 miles to Peoria. This branch joins the main line near Rockford and the Portage branch at Davis Junction. When completed it will furnish a short route from Peoria to Milwaukee.

Colorado, Texas & Mexico.—This company recently increased its capital stock from $200,000 to $375,000, for the purpose of building an extension from a point on the Red river to Comfort, Tex., a distance of about 400 miles. The proposed road will connect with the San Antonio & Aransas Pass. Morris R. Locke is President, and J. H. Parramore, C. W. Merchant, C. S. Bass, R. B. Anderson, J. M. Daugery, F. C. Digby-Roberts, J. C. Lowden and Fred Cockrell, directors.

Denver & Rio Grande.—Announcement has been made that work will soon be started on a cut-off from Westwater, Utah, just west of the Colorado line, west to a point between Sagers and Thompsons, a distance of about 30 miles. This will shorten the line about 8½ miles. A cut-off is also to be built from Green River west to a point near Marysvale, a distance of about 115 miles. This will connect with the projected Western Pacific.

Track laying on the first 18 miles out of Durango, on the Durango-Farmington extension of this road was begun June 15, a Robert track-layer being used. This section includes the heaviest grade on the extension.

Franklin & Clearfield (New York Central).—This road, which is said to be controlled by the New York Central, has secured rights of way and will shortly let contracts for building a railroad from Franklin, Venango County, Pa., southwest to Brookville, in Jefferson County. It is proposed later to build to Reynoldsville, about 55 miles, where connection will be made with the Buffalo, Rochester & Pittsburg.

Grand Trunk Pacific.—Announcement has been made that the location plans of this road have been approved by the Railway Commission, and that the first construction

work has been authorized. It is on a distance of three and four miles east and west of Kakabeka, which is 19 miles west of Fort William. The Railway Commission has also approved the route showing the general direction of the whole of the branch from Fort William north over 200 miles to a point on the main line about 50 miles north of the village of Wavagoon.

HOPKINSVILLE BELT LINE.—Incorporation has been asked for by a company under this name in Kentucky with a capital of $100,000, to build a belt line around the city of Hopkinsville, Ky., connecting the Illinois Central & Tennessee Central, and, through these roads, connecting with the Louisville & Nashville. The incorporators are H. M. Dalton, W. R. Wicks, L. H. Cravens, M. O. Mason, J. B. Jackson, J. M. Renshaw, and J. B. Russell.

HOUSTON, BEAUMONT & RED RIVER.—This company, which was recently incorporated in Texas, has plans ready for its proposed road. They show the route for a distance of about 204 miles from Houston north to Humble, thence east crossing the Trinity river 16 miles north of Liberty and 15 miles south of the Santa Fe line; thence through Batson and Sour Lake to the Sabine river and to Leesville, La., passing through a rich territory, and thence to Alexandria.

HUDSON & MANHATTAN.—The commission appointed by the New York Supreme Court to consider the application of this company has filed a favorable report approving the proposed railroad tunnels to be built by this company beneath the Hudson River from Jersey City to Cortlandt street, in the borough of Manhattan, New York.

KANSAS CITY, MEXICO & ORIENT.—A contract has been given by this company to John P. Hughes, of Fort Worth, Tex., for building an extension from Sweetwater, Tex., south to San Angelo, a distance of 75 miles.

KENTUCKY MIDLAND.—This company's road is being built from Wheatcroft, Ky., north to Providence, about 12 miles, by Irving H. Wheatcroft. The road will pass through undeveloped coal fields.

MEMPHIS & PENSACOLA.—A charter has been granted a company in Mississippi under this name to build a railroad from Memphis to Pensacola, Florida, via Meridian. The company proposes to have its line completed in about two years. The incorporators include: E. T. Haynes, W. C. Roberts, G. A. Scott and H. I. Willey, of New York, and F. F. Woodworth, of Kinderhook, N. Y.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—A contract is reported let by this company to the Winston Bros. Co. for at once building a line paralleling the Farmers' road. The proposed route is from Dent's Lake, north to the Canadian Pacific, crossing the Farmers' road at Starkweather, N. Dak.

NORTHERN PACIFIC.—An officer writes that surveys are being made for building a branch from some point on the Pacific line through the Clearwater Valley to Grangerville, Idaho, but that the definite location of the line has not yet been determined.

NORWAY & WESTERN.—A company under this name has been incorporated at Augusta, Me., with a capital of $150,000, to build a line from East Stoneham, Me., east through Stoneham, Albany and Waterford, to a connection with the Grand Trunk at Norway, a distance of 21 miles. The road will be operated by either steam or electric power. The directors include F. H. Noyes, of Norway; W. G. Rand, of Boston; Jonathan Bartlett, of Stoneham; L. H. Burnham, of Albany, and W. H. Kilgore, of North Waterford.

NUECES VALLEY, RIO GRANDE & MEXICO.—This company, which is building a road from Carrizo Springs, Tex., via Darlington, to Delrio, a distance of 123 miles, is also planning to build a branch line to Aransas Pass, about 170 miles. The company has a capital of $300,000, and W. A. Squires is interested.

OCEAN VIEW & PINE BEACH.—Incorporation has been granted this company in Virginia with a capital of $25,000, with offices at Norfolk, Va., to build a railroad. H. L. Page is President; B. W. Leigh, Vice-President; and M. C. Elliott, Secretary and Treasurer.

PORT ARTHUR & HOUSTON SHORT LINE.—A contract has been given by this company to H. S. Best, of Port Arthur, Tex., for building the first 40 miles of its proposed road from Port Arthur west to Houston, Tex.

QUEBEC & SAGUENAY (ELECTRIC).—Arrangements are being made by this company to build an electric railroad from St. Joachim de Montmorency, Que., northeast to Tadousac, a distance of about 110 miles. R. Forget is President; Senator Choquette, Vice-President, and J. A. McDonald, Secretary.

ST. LOUIS & SAN FRANCISCO.—This company is planning to extend its line from Brady, Tex., to Waring, on the San Antonio & Aransas Pass, a distance of about 100 miles.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—Plans, it is said, are being made by the engineering department for laying about 109 miles of second main track, and to increase the terminal facilities in the neighborhood of Little Rock and at other places in Arkansas.

SAN ANTONIO & GULF.—Announcement has been made that bids for building this proposed road will soon be asked for. The line is from Stockdale, Tex., east to Cuero, a distance of 40 miles. The building of this road is to comply with the requirements of the Southern Pacific merger bill passed by the Legislature at its last session.

SOUTH BEND WESTERN.—This company has given a contract to George Townsend, of Indianapolis, for building an electric line from South Bend, Ind., west to Laporte, about 30 miles, parallel to the Lake Shore & Michigan Southern. Construction work will begin soon and cars running within six months. The completion of this line will give South Bend electric railway connection east, west and north, all under what is known as the Indiana Railway Company's system. The South Bend & Southern Michigan, under the same ownership, operating 10 miles of road north to Niles, Mich., is now being extended northwest to St. Joseph, Mich. The company also proposes to build a line to Buchanan, Mich., 14 miles from South Bend.

SYLVANIA & SAVANNAH.—A charter has been granted in Georgia to this company to build a railroad from Sylvania, Ga., east to a point on the Savannah river, between Hutchins Ferry and Poor Robin Landing, a distance of about 20 miles. The incorporators include: P. A. Mock, L. H. Hutton Co., S. S. White, W. I. Cooper and others, of Sylvania.

TENNESSEE & ATLANTIC.—This company, which was recently formed to build a railroad from Harriman to Tellico Plains, Tenn., will, it is announced, begin construction work about July 15. The road will traverse a rich mineral and timber section. E. C. Myers is President, and Sam. P. Sparks, Secretary.

TENNESSEE ROADS (ELECTRIC).—A company is being formed to build an electric road from Humboldt, Tenn., southwest through Alamo, Maury City, Brownsville, Phelan, Wright and Bolton to a connection with the electric road at Raleigh, giving connection to Memphis, a distance of about 80 miles.

TEXAS ROADS.—A number of northern capitalists are planning to build a railroad from Lometa, Tex., on the Gulf, Colorado & Santa Fe, southwest through San Saba and Menardville to Delrio, on the Southern Pacific, a distance of about 200 miles. Half of the line will follow the valley of the San Saba. It is supposed that this is a project of the Santa Fe.

Plans are being made by Captain Thomas H. Dodge, of Laredo, Tex., to build a railroad from that place down the valley of the Rio Grande river to Rio Grande City, a distance of about 150 miles.

Surveys are being made by William S. Carlysle & Co., of Chicago, for building a railroad from Trinity, Tex., southeast to Livingston, 32 miles.

WESTERN MARYLAND.—Contracts are about to be let by this company for the revision of a portion of its main line in the Potomac Valley from Williamsport to Pig Pool, a distance of about 10 miles. Rights of way are also being secured for a change of line and double tracking east of Emery Grove.

RAILROAD CORPORATION NEWS.

ALTOONA & LOGAN VALLEY (ELECTRIC).—This company, which is controlled by the American Railways Co., of Philadelphia, has given notice that its issue of $470,500 divisional first-mortgage 5 per cent. bonds has been called for redemption on July 1 at 105 and interest.

ATLANTIC COAST ELECTRIC.—The order to sell this company's property at foreclosure under the general mortgage ($500,000) of 1896 has been affirmed by the United States Court of Appeals. The company owns and leases about 24 miles (10 on private right of way) in and near Asbury Park and Long Branch, N. J.

AUGUSTA SOUTHERN (SOUTHERN).—An issue of $100,000 second-mortgage bonds has been authorized by the stockholders. It is reported that $40,000 of this amount will be used to fund floating debt. The road runs from Augusta, Ga., to Tennille, 82½ miles. It is controlled by the Southern, but operated independently.

BIRMINGHAM, SHEFFIELD & TENNESSEE RIVER.—This road, which is now part of the Southern, was in 1895 sold at foreclosure to a reorganization committee, which organized the Northern Alabama as its successor. The Northern Alabama issued $1,700,000 bonds and $2,000,000 stock, which were turned over to a reorganization committee, which held them until July, 1898, when a plan of reorganization was completed. Under this plan the bondholders of the Birmingham, Sheffield & Tennessee River were to receive 40 per cent. in new bonds and 60 per cent. in new stock of the Northern Alabama. In October of the same year, the Southern Railway made an offer to buy all the bonds of the Northern Alabama at 80 (equal to $320 for each $1,000 bond of the Birmingham, Sheffield & Tennessee River). One of the bondholders which had deposited its bonds of the Birmingham, Sheffield & Tennessee River with the reorganization committee was the Industrial & General Trust, Ltd., of London. This company refused to accept the new securities of the Northern Alabama and sued the reorganization committee for breach of contract. This suit has just been decided by the United States Court of Appeals in favor of the Industrial & General Trust, which obtains a verdict for $336,750 damages. This decision was based on the fact that the reorganization committee failed to file a plan of reorganization prior to the foreclosure sale of the original road. The court took the view that this delay had left the depositing stockholders helpless to protect their interest. The method of ascertaining damages was complicated, necessitating a special jury. In determining the intrinsic value of the railroad property, of which it was held that the Industrial & General Trust was entitled to its proportionate share, the court declared that there should be taken into consideration the character and condition of the physical property; the character and population of the district through which the road ran; the resources, mineral, industrial and agricultural, of the region; the relation of the road to other railroads: the strategic position, cost of reproduction; opinions expressed as to future value, and any other fact affecting its desirability as a going concern. On this basis the verdict of $336,750 was rendered.

CANADIAN NORTHERN.—The London Stock

Exchange has listed scrip for $9,347,175 50-year first-mortgage 3 per cent. guaranteed debenture stock. The Canadian Government in July, 1903, guaranteed this stock at $13,000 a mile for building 620 miles of line from Grandview, Manitoba, to Edmonton, Alberta, and 100 miles east from Prince Albert, Saskatchewan.

CANADIAN NORTHERN.—The Mackenzie & Mann interests have incorporated the Canadian Northern Lands Co. with a capital of $5,000,000 to sell 500,000 acres of lands. This is part of the Canadian Northern Railway land grant. It wac taken over by the Lands Co. at a valuation of $3 an acre.

CHICAGO, BURLINGTON & QUINCY RAILROAD.—Notice has been given that the $19,699,000 consolidated mortgage bonds of July 1, 1903, will be paid at the extended date of maturity at the National Bank of Commerce in New York, or at the company's office in Boston. These bonds were extended to July 1, 1905.

CHICAGO GREAT WESTERN.—It has been announced that the purpose of the proposed issue of $14,000,000 preferred "B" stock, to be voted on on September 7, is the acquisition of the same amount of 4 per cent. non-cumulative preferred stock of the Mason City & Fort Dodge, notice of the issue of which was also given last week. The Mason City & Fort Dodge is the Omaha line of the C. G. W., and is leased to the C. G. W. for 100 years. The excess of earnings above expenses of that road constitutes a fund in the hands of the Chicago Great Western out of which the latter road agrees to pay interest at the rate of 4 per cent. a year on $19,840,000 of the first-mortgage bonds of the Mason City & Fort Dodge. Any surplus above this interest payment is retained by the Chicago Great Western. The Mason City & Fort Dodge has already issued $12,000,000 of first-mortgage bonds. Instead of issuing $7,840,000 more it agrees to issue $14,000,000 in 4 per cent. preferred stock to be transferred to the Chicago Great Western in exchange for the same amount of the latter's preferred "B" stock. In this way earnings of the Mason City & Fort Dodge, which would otherwise have to be held as a fund to pay the interest on the additional amount of bonds, can be used by the Chicago Great Western.

COLORADO & SOUTHERN.—The stockholders of this company have voted to authorize the proposed mortgage for $100,000,000. Of this amount, $17,000,000 has already been underwritten.

GEORGIA, FLORIDA & ALABAMA.—A suit has been begun in the United States Circuit Court in Florida to foreclose the mortgage on the Carrabelle, Tallahassee & Georgia Railroad. The mortgage secures $500,000 first mortgage 6 per cent. bonds of 1914. This action is probably preparatory to consolidation with the Georgia, Florida & Alabama. The road runs from Carrabelle, Fla., to Tallahassee, 50 miles.

GRAND TRUNK PACIFIC.—The London Stock Exchange has listed scrip for $15,552,000 3 per cent. first-mortgage sterling bonds. These bonds are guaranteed by the Dominion Government.

This company is asking permission from the Dominion Government to increase its bonding privileges on the Prairie section from $20,000 to $21,000 per mile, and on the Lake Superior branch from $30,000 to $34,000 per mile.

HUDSON VALLEY (ELECTRIC).—This road, many of whose securities were held by the failed Merchants' Trust Co., of New York, has been sold to a syndicate headed by John W. Herbert and Addison B. Colvin. This sale will have to be approved by the court as part of the liquidation of the trust company's affairs.

ILLINOIS, IOWA & MINNESOTA.—It is announced that the Rockford Belt Railway, incorporated in Illinois in February to build a belt line about the city of Rockford, with a line to Freeport, is allied to the Illinois, Iowa & Minnesota. The stockholders of the Rockford Belt will vote on August 16 to increase the capital stock from $100,000 to $1,000,000, and to issue not more than $1,000,000 first mortgage bonds.

INDIANAPOLIS & NORTHWESTERN TRACTION.—E. H. Rollins & Sons, of Boston, are offering at 98 $1,000,000 of the first-mortgage 5 per cent. gold bonds of 1923 of this company, redeemable on any interest date at 110 and interest. The company has $2,550,000 common stock and $450,000 6 per cent. non-cumulative preferred stock authorized and issued, and $3,000,000 first-mortgage bonds, of which $2,470,000 are outstanding. The company owns 87 miles of electric road from Indianapolis northwest through Lebanon and Frankfort to Lafayette, with a branch from Lebanon to Crawfordsville, all built on private rights of way, except within city limits.

INTERCOLONIAL.—The annual report, to be issued June 30, as announced by the Canadian Minister of Railways and Canals, will show a deficit for the year of from $1,500,000 to $2,000,000. This unfavorable showing is attributed to the severe weather of the winter, an increase of $750,000 in payments for wages and to competition with the Canadian Pacific in through traffic. It is announced that the Prince Edward Island Railway, another government road, will also show a deficit.

LONG ISLAND.—The Long Island Railroad and the Interborough Rapid Transit Co. have jointly bought the New York & Long Island Traction Co. for a price said to be $1,500,000. With the purchase, a formal announcement was made that the lines of the traction company would be operated in connection with the Queens County trolley lines of the New York & Queens County Railroad for the general development of Queens County and as feeders for the Long Island Railroad. The New York & Queens County Railroad is owned by the Interborough Rapid Transit Co. As the Pennsylvania, which controls the Long Island, is generally considered to be, with the New York, New Haven & Hartford, in alliance with the Metropolitan Street Railway in its plans for subway building, the news of this joint purchase by the Long Island and the Interborough may be an indication of an alliance between the Metropolitan and Interborough interests. The New York & Long Island Traction Co. has 30½ miles of double-track road from Mineola to Freeport, Hempstead to Queens, and Freeport to Valley Stream, with several projected branches. The New York & Queens County operates nearly all the trolley lines from Long Island City to Flushing, Elmhurst, Corona, Astoria, Whitestone and College Point. The two companies together control practically all existing trolley franchises for the counties of Queens and Nassau.

MEXICAN CENTRAL.—This company has filed at Boston, a certificate of an increase in its capital stock from $48,875,000 to $160,000,000. Of the new stock $21,125,000 will be used in acquiring additional property, $5,000,000 in exchange for an equal amount of stock of the Mexican Pacific Railway and $25,000,000 for exchange of income bonds. It is reported that work on the extension to the Pacific coast via Colima will be begun at once.

MOBILE & OHIO.—A dividend of 4 per cent. on the capital stock has been declared. The first dividend on the stock was 2 per cent., which was paid a year ago.

NEW YORK & OTTAWA (N. Y. C. & H. R.)—The New York State Railroad Commission has granted authority to this road to issue a first mortgage for $2,500,000. Of this amount, about $1,500,000 is to pay for the property of the former company of the same name sold at foreclosure sale to the New York Central and the rest is to be used for improvements.

NEW YORK CENTRAL & HUDSON RIVER.—Application has been made to the New York Stock Exchange to list $8,000,000 additional 3½ per cent. mortgage bonds of 1997.

NEW YORK CENTRAL LINES.—For the six months ending June 30, for five of the New York Central lines, and also for the quarter ending June 30, for the New York Central & Hudson River system proper, statements of earnings, partly estimated, have been made.

Gross earnings of the New York Central & Hudson River for the quarter ending June 30 were $20,792,600, an increase of $1,551,300 over 1904, and for the six months, $39,235,700, an increase of $2,762,900. Net earnings for the quarter were $6,455,800, an increase of $1,190,900 over 1904, and for the six months, $11,061,800, an increase of $1,667,500.

The Lake Shore & Michigan Southern for the six months shows gross earnings of $18,166,097, an increase of $1,027,851, and net earnings of $4,320,039. The latter is practically the same figure as for the corresponding period in 1904.

The Michigan Central earned $10,676,886. This is an increase of $211,414 over 1904. Net earnings were $215,754, a decrease of $35,552.

The Lake Erie & Western (including the Northern Ohio) had gross earnings of $2,277,854, a decrease of $47,374 from 1904, and net earnings of $590,472. The latter figure shows only a slight change from the previous year.

Gross earnings of the Indiana, Illinois & Iowa were $925,282, an increase of $87,227, and net earnings were $241,463, an increase of $53,045.

NEW YORK, NEW HAVEN & HARTFORD.—This company has sold to J. P. Morgan & Co. $15,000,000 50-year 4 per cent. debenture bonds. President Mellen says that these bonds will be used in funding the loan occasioned by the purchase of New York, Ontario & Western stock. In October, 1904, a majority of the $58,117,982 New York, Ontario & Western stock was bought at $45 a share.

An appeal from the decision of the Connecticut Supreme Court has been made by Charles K. Offield, of Chicago, who owns two shares of the New Haven & Derby Railroad. The New York, New Haven & Hartford owns all the rest of the stock and instituted condemnation proceedings to obtain these two shares. The Superior Court and later the Supreme Court decided in favor of the railroad company. The case now goes to the United States Supreme Court. Mr. Offield demands $1,000 a share for his stock, the market price of which is said to be $171.

PENNSYLVANIA.—The New York Stock Exchange has listed $1,106,650 additional capital stock. This makes the total listed $302,087,200. Of the amount authorized there still remains to be listed before June 30 $624,750, which will make the total amount on that date $302,711,950.

PHILADELPHIA & ERIE.—A 6 per cent. dividend has been declared on the common stock of this company. For the last three years 4 per cent. has been paid. A payment of 2 per cent. in 1901 was the first payment on the common stock for seven years. The road is leased to the Pennsylvania.

PORT ANGELES PACIFIC.—W. F. Delabarre, of Seattle, has been appointed receiver of this road, which has 6½ miles of track leading out of Port Angeles, Wash. The road is projected to run 100 miles further.

ST. LOUIS SOUTHWESTERN.—The New York Stock Exchange has listed $1,500,000 additional consolidated mortgage 4 per cent. bonds of 1932 and has given authority to add $118,000 more on notice of issue. This would make the total listed $16,796,000.

WASHINGTON, BALTIMORE & ANNAPOLIS.—(ELECTRIC).—In addition to the mortgage securing $3,000,000 first-mortgage 30-year gold bonds which was recently filed, a mortgage to secure $1,000,000 second mortgage 5 per cent. 25-year bonds has been filed by this company.